THE STATE OF WATER SUPPLY RELIABILITY IN THE 21st CENTURY

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON WATER, OCEANS, AND WILDLIFE

OF THE

COMMITTEE ON NATURAL RESOURCES
U.S. HOUSE OF REPRESENTATIVES

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OVERSIGHT HEARING ON THE STATE OF WATER SUPPLY RELIABILITY IN THE 21st CENTURY

Tuesday, February 26, 2019
U.S. House of Representatives
Subcommittee on Water, Oceans, and Wildlife
Committee on Natural Resources
Washington, DC

The Subcommittee met, pursuant to notice, at 10:02 a.m., in room 1324, Longworth House Office Building, Hon. Jared Huffman [Chairman of the Subcommittee] presiding.

Present: Representatives Huffman, Napolitano, Costa, Sablan, Cox, Neguse, Levin, Cunningham; McClintock, Hice, Radewagen, and Fulcher.

Mr. HUFFMAN. Good morning, everyone. The Subcommittee on Water, Oceans, and Wildlife will come to order.

The Subcommittee is meeting today to hear testimony on the state of water supply reliability in the 21st century.

Under Committee Rule 4(f), any opening statements at this hearing will be limited to the Chairman, the Ranking Member, the Vice Chair, and the Vice Ranking Member. This allows us to hear from our witnesses sooner and helps keep Members on schedule. Therefore, I ask unanimous consent that all other Members' opening statements be made part of the record if they are submitted to the Committee Clerk by 5 p.m. today, or the close of the hearing, whichever comes first.

Hearing no objection, it is so ordered.

STATEMENT OF THE HON. JARED HUFFMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. HUFFMAN. Thanks, everyone, for joining us today. I believe this is an important hearing, an important chance to examine the state of water supply reliability in our Nation.

As I mentioned at our last WOW Subcommittee hearing, one of my goals this Congress is to focus on the factual and the scientific baseline for natural resource issues in this Subcommittee's jurisdiction through what I informally referred to as "WOW 101" hearings. This is the second one.

Finding consensus on tough issues, of course, is hard. But I believe we can make progress on that front if we can develop a common understanding of the baseline facts and science before jumping right into the most contentious policy debates. And that is why we are having these hearings.

I am also personally meeting with every member of this Subcommittee on both sides of the aisle, to get feedback and explore areas where we can work together. Thanks to the members that have met with me so far. I truly believe that there are good

ideas on both sides of the aisle, and I am hopeful this Subcommittee will disprove that old notion that "water is for fighting over," and instead work to come up with common-sense, scientifically-based solutions to the challenges we face.

So, let's get started. Today, we will be looking at the state of our Nation's water supply and water supply challenges. As many here know, the western United States has been suffering from frequent and increasingly severe drought in recent years.

For example, in my home state of California, we recently emerged from the state's worst drought in 1,200 years, according to some credible scientific reports. In the northern Great Plains, we recently experienced an extreme drought that NOAA categorized as a "$1 billion disaster." And the Colorado River, which supplies water to 40 million people and 5.5 million acres of farmland in seven western states and Mexico, is currently going through its 19th year of drought, with no end in sight.

Today, we will hear from witnesses about the specific challenges caused by these water shortages. We will hear today from community voices about what happens when rural communities literally run out of water for basic human needs because of drying wells. We will hear how water shortages have impacted coastal communities and thousands of fishermen. In my district and along the Pacific Coast, fishing families have been dealt multi-million-dollar blows in recent years because of water shortages that have battered our salmon fisheries.

We will also hear about the great costs of water shortages to agriculture, cities, tribes, and western states.

And, finally, we will hear today what the science says about how climate pressures will make our water challenges more difficult in the future. Climate pressures, including warming temperatures, shrinking snowpack, more volatile precipitation, rising seas, just to name a few, will reduce our water supply and impact millions of Americans. It is important that this Subcommittee soberly assess and plan for these challenges.

Part of that process requires a thoughtful evaluation of policy options. I look forward to a thorough examination of the policy options that this Subcommittee can pursue to promote water supply reliability and resilience now and in the years to come.

One policy option that we will hopefully agree on is the need to invest in water infrastructure. Much of our existing infrastructure is nearing the end of its design life and is in great need of maintenance and repair.

Last Congress, I worked across the aisle with Representative Gosar on a bill that would regularly require the Bureau of Reclamation to assess and publicly disclose major repair and rehabilitation needs for Reclamation projects. That bill recently passed the Senate as part of the omnibus public lands package, and I think it is a good first step in working across the aisle to address our repair and maintenance needs. I hope we will see it move through the House and signed by the President soon.

I will also commit to work across the aisle on other areas of bipartisan agreement, such as the need to construct new water infrastructure to grow our water supply. That new infrastructure can include a variety of projects, including smart storage, water reuse,

desalination, and water-use efficiency projects. It is imperative that this Subcommittee work on these kinds of common-sense projects that will promote water supply reliability for all stakeholders.

To conclude, I look forward to this Subcommittee evaluating and addressing our water challenges in a deliberative and open way. Communities need clean water to drink. Farmers need water to irrigate their crops. Fish and wildlife and the people whose livelihood depend on them need water to survive and to thrive. This Subcommittee will work hard to ensure water supply reliability for all of these important stakeholders.

Finally, I would like to welcome members of the Association of California Water Agencies, ACWA. I see several in the crowd here this morning. We look forward to working with you on all of these issues to promote water supply sustainability and reliability.

[The prepared statement of Mr. Huffman follows:]

PREPARED STATEMENT OF THE HON. JARED HUFFMAN, CHAIR, SUBCOMMITTEE ON WATER, OCEANS, AND WILDLIFE

Thank you everyone for joining us today for an important hearing examining the state of water supply reliability in our Nation.

As I mentioned at our last "WOW" hearing, one of my goals this Congress is to work to reset the factual and scientific baseline for natural resources issues in this Subcommittee's jurisdiction through what I informally refer to as "WOW 101."

Finding consensus on tough issues is a formidable task. But I believe we can make progress on that front if we can develop a common understanding of the baseline facts and science before jumping right into the most contentious policy debates. That's why we're having these 101 hearings.

I am also personally meeting with every member of this Subcommittee, on both sides of the aisle, to solicit feedback and explore areas where we can work together. I truly believe there are good ideas on both sides of the aisle. And I'm hopeful that this Subcommittee can work together to disprove that old notion that "water is for fighting over," and instead work to come up with common-sense, scientifically-based solutions to the challenges before us.

So, let's get started. Today, we'll be looking at the state of our Nation's water supply and the water supply challenges we'll face in the 21st century.

As many here know, the western United States has been suffering from frequent and increasingly severe drought in recent years:

For example, in my home state of California, we recently emerged from the state's worst drought in 1,200 years, according to some scientific reports.

In the northern Great Plains, we recently experienced an extreme drought that NOAA categorized as a "billion-dollar disaster."

And the Colorado River—which supplies water to 40 million people and 5.5 million acres of farmland in seven western states and Mexico—is currently going through its 19th year of drought, with no end in sight.

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And finally, we'll hear today what the science says about how climate pressures will make our water challenges more difficult in the future. Climate pressures—including warming temperatures, shrinking snowpack, more volatile precipitation, and rising seas, to name a few—will reduce our water supply and impact millions of Americans. It's important that this Subcommittee soberly assess and plan for these challenges.

Part of that planning requires a thoughtful evaluation of policy options. I look forward to a thorough examination of the policy options that this Subcommittee can pursue to promote water supply reliability now and in the years to come.

One policy option that we'll all hopefully agree on is the need to invest in our water infrastructure. Much of our existing water infrastructure is nearing the end of its design life and is in great need of maintenance and repair.

Last Congress, I worked across the aisle with Representative Gosar on a bill that would regularly require the Bureau of Reclamation to assess and publicly disclose major repair and rehabilitation needs for Reclamation water projects. That bill recently passed the Senate as part of the omnibus public lands package, and I think it is a good first step in working across the aisle to address our repair and maintenance needs. I hope we see it move through the House and signed by the President soon.

I'll also commit to work across the aisle on other areas of bipartisan agreement—such as the need to construct new water infrastructure to grow our water supply. That new infrastructure can include a variety of projects, including smart storage, water reuse, desalination, and water-use efficiency projects. It's imperative that this Subcommittee work on these kinds of common-sense projects that will promote water supply reliability for all stakeholders.

So, to conclude, I look forward to using my role on this Subcommittee to evaluate and address our water challenges in a deliberative and open way. Communities need clean water to drink. Farmers need water to irrigate their crops. Fish and wildlife and the people whose livelihoods depend on them need water to survive and thrive. This Subcommittee will work hard to ensure water supply reliability for all of these important stakeholders.

Ranking Member McClintock, I hope we can find opportunities to work together to get things done. While we may have some differences in outlook, there are many common-sense solutions that Republicans and Democrats can pursue on this Subcommittee, and I hope you'll join us in that effort.

Finally, I would like to welcome members of the Association of California Water Agencies in the audience today—we look forward to hearing from you and working with you as well to promote water supply reliability.

With that, I want to invite the Ranking Member to say a few remarks, and then we will welcome and introduce our witnesses.

Mr. HUFFMAN. With that, I want to invite the Ranking Member to say a few remarks, and then we will welcome and introduce our witnesses.

STATEMENT OF THE HON. TOM MCCLINTOCK, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. MCCLINTOCK. Thank you, Mr. Chairman. According to the EPA, since 1901, global precipitation has actually increased at an average rate of roughly one-tenth of an inch per decade, while precipitation in the contiguous 48 states has increased at a rate of nearly two-tenths of an inch per decade. Globally, annual rainfall alone produces roughly 18,000 gallons of fresh water every day for every man, woman, and child on this planet. The problem is this abundance of fresh water is unevenly distributed over time and space.

Throughout the 20th century, it was the policy of this government to guarantee abundant water for all the people and regions of our country. We built reservoirs to transfer water from wet years to dry years, and we built canals to transfer water from wet regions to dry ones. By doing so, we made the deserts bloom, we protected our communities from floods and droughts, and we opened up vast tracts of land to support a prosperous population made possible by water abundance.

Sadly, these policies were reversed over the last 45 years. In my region, 4 years of drought, combined with massive pulse-flow water releases mandated by environmental laws, drained our reservoirs to nearly deadpool levels. The next year, an atmospheric river

opened up, requiring the loss of massive amounts of water to the ocean, because we had no place to store it—not for lack of suitable sites, but because of inaction in using them.

The climate is constantly changing, which requires constant adaptation. Up until 5,000 years ago, the Sahara was one of the wetter regions of our planet, with frequent monsoons that produced the largest freshwater lake in the world. During the Roman warm period, much of the Roman grain supply was grown in North Africa.

The foresight of America's 20th century water engineers should be more apparent today. In the modern warm period, water will be stored for less time as snow in the mountains, which means that without new reservoirs to capture this runoff, it will be lost to the ocean.

During the last several Congresses, the House sent major legislation to the Senate to expedite and reform the permitting process that has made the construction of new reservoirs endlessly time consuming and ultimately cost-prohibitive. Unfortunately, the Senate failed to act.

As one example, the Shasta Dam was built to an elevation of 600 feet and stores about 4½ million acre-feet of water. But it was designed to an elevation of 800 feet. The difference is 9 million acre-feet of water storage. Yet, less than 20 feet of additional elevation, about 600,000 acre-feet of additional storage, has been stalled for decades in an endless cycle of environmental studies with no end in sight.

Droughts are nature's fault. They happen. But water shortages are our fault. They are a choice that we made when we stopped building adequate storage to meet the needs of the next generation.

We are told that reservoirs are old-fashioned, and we must look to solutions like conservation, recycling, and desalination. Well, we need to understand what that actually means.

Conservation does not add a drop to our water supply, it merely copes with the shortage that our own policies have imposed. And there is a limit to how much conservation can be mandated before it begins to have a significant negative impact on the quality of life for our people. Californians are soon to get a major lesson in this when mandated, year-round water rationing signed by Governor Brown takes effect in a few years.

Recycling and desalination makes sense in deserts where water is scarce and can't be imported. Fortunately, most regions of our country are blessed with abundant water. According to the California Energy Commission, surface water storage costs between $400 and $800 per acre-foot; while water desalination costs between $1,800 and $2,800 per acre-foot; and water recycling between $1,200 and $1,800 per acre-foot.

In other words, storing water before it is lost to the ocean costs a mean of $600, while reclaiming it once it has been lost to the ocean costs about $2,300. Water desalination is a great idea if you don't mind your water bill quadrupling.

We should be looking at the most cost-effective ways to produce water abundance, not the most expensive. That is the difference between abundance and scarcity, the difference between prosperity and rationing, and the difference between the policies before us today.

I yield back.

[The prepared statement of Mr. McClintock follows:]

PREPARED STATEMENT OF THE HON. TOM MCCLINTOCK, RANKING MEMBER, SUBCOMMITTEE ON WATER, OCEANS, AND WILDLIFE

According to the EPA, since 1901, global precipitation has increased at an average rate of 0.08 inches per decade, while precipitation in the contiguous 48 states has increased at a rate of 0.17 inches per decade. Globally, annual rainfall alone produces roughly 18,000 gallons of fresh water every day for every man, woman and child on this planet.

The problem is that this abundance of fresh water is unevenly distributed over space and time. Throughout the 20th century, it was the policy of this government to guarantee abundant water for all the people and regions of our country. We built reservoirs to transfer water from wet years to dry years and we built canals to transfer water from wet regions to dry ones. By doing so, we made the deserts bloom and opened up vast tracts of land to support a prosperous population made possible by water abundance.

Sadly, these policies were reversed over the last 45 years. In my region, 4 years of drought, combined with massive pulse flow water releases mandated by environmental laws, drained our reservoirs nearly to dead-pool levels. The next year, an atmospheric river opened up, requiring the loss of massive amounts of water to the ocean because we had no place to store it—not for lack of suitable sites, but for lack of action in utilizing them.

The climate is constantly changing, which requires constant adaptation. Up until 5,000 years ago, the Sahara was one of the wetter regions of the planet, with frequent monsoons that produced the largest freshwater lake in the world. During the Roman Warm Period, much of the Roman grain supply was grown in North Africa.

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lost to the ocean costs $2,300. Water desalination is a great idea if you don't mind your water bill quadrupling.

We should be looking at the most cost-effective ways to produce water abundance—not the most expensive. That is the difference between abundance and scarcity—the difference between prosperity and rationing—and the difference between the policies before us.

Mr. HUFFMAN. Thank you, Mr. McClintock. We will now hear from our witnesses.

Let me remind the witnesses that under our Committee Rules, they must limit their oral statements to 5 minutes. But their entire statement will still appear in the hearing record.

When you begin, the lights on the witness table will turn green. After 4 minutes, you will see the yellow light come on. Your time will have expired when the red light comes on, and I will ask you to please complete your statement.

I will also allow the entire panel to testify before we turn to questions from the Members.

I will now begin with the witnesses. I see that Mr. Neguse is here. Our first witness is from Colorado. We will invite the gentleman from Colorado to introduce his home state constituent.

Mr. NEGUSE. Thank you, Mr. Chairman, for giving me the opportunity to do that. And I am so honored and pleased to introduce Mr. Bradley H. Udall from my district, the Colorado 2nd District.

Brad currently serves as the Senior Water and Climate Research Scientist for Colorado State University's Colorado Water Institute. He helped author the Fourth National Climate Assessment, and he is an expert, literally in the sense of the word, in anything related to western water.

I also would be remiss if I didn't point out the weight, certainly, that we all feel, and that certainly Brad must be feeling, in testifying in this room. If you all look to the back of the room, you can see the picture of his father, the legendary Mr. Morris Udall.

Brad, it is such an honor to have you here today, and I certainly know that your father would be very proud, as is the state of Colorado. Thank you for taking the time to come testify and help us learn about a topic that is extremely important to our district, our state, and our country.

I yield back, Mr. Chair.

Mr. HUFFMAN. Thank you.

It is an honor to have you, Mr. Udall.

STATEMENT OF BRAD UDALL, SENIOR WATER AND CLIMATE RESEARCH SCIENTIST, COLORADO WATER INSTITUTE, COLORADO STATE UNIVERSITY, FORT COLLINS, COLORADO

Mr. UDALL. Thank you, Chairman Huffman, Ranking Member McClintock, and other members of the panel. Thank you for providing me an opportunity to speak. I am a senior scientist at Colorado State University, where I study how climate change will affect Western U.S. water supplies. Today, I want to focus on the Colorado River.

After 19 years of unprecedented low flows and over-use in the lower basin, the Nation's two largest reservoirs, Lakes Mead and Powell, are now barely 40 percent full. Without major action by the

Colorado River Basin states, there is a substantial risk of draining Lake Mead to deadpool in the next 7 years, an event that would prove to be very challenging.

Since 2000, Colorado River flows have been 19 percent below the 20th century average. Temperatures in the basin are now 2 degrees Fahrenheit warmer, and those temperatures are certain to continue rising. Scientists have begun using aridification to describe the ongoing hot and dry climate in the basin, rather than just drought.

In 2017, Jonathan Overpeck and I found that higher temperatures due to climate change had reduced the flow of the Colorado River by approximately 6 percent, and that additional warming could reduce flows by approximately 20 percent by 2050, and up to 35 percent by 2100, should precipitation remain the same.

Higher temperatures increase evaporation from soils and water bodies, increase sublimation from snowpacks, and increase water use by plants, due to a longer growing season and more warmth on any given day. Other studies have come to similar conclusions.

The 2018 National Climate Assessment found that snowpacks are being reduced, so melt runoff is occurring earlier in the year, and flows in the fall are lower. More of our precipitation is occurring as rain, rather than snow.

The not-yet-approved Drought Contingency Plan is an important first step to solving the basin's problems. It significantly reduces the chance of emptying Lake Mead. Most critically, the DCP buys us time to implement more permanent solutions. However, it leaves many hard decisions for the next plan.

Negotiations for that replacement plan should begin next year. This plan needs to be a climate change plan for the basin. The planning process should be open and inclusive. It should solve the over-use problem in the lower basin and prepare for extended and unprecedented low flows. It should also re-visit a number of long-standing assumptions about how the river is being managed, including the upper basin's so-called delivery obligation, who bears the burden of solving the lower basin's over-use, and how the reservoirs are operated.

I want to offer a few suggestions for how the Federal Government might help ensure water security in the basin. Additional ideas are in my written testimony.

With climate change, the past is no longer a guide to the future. This makes planning very difficult. Scientists need to devise new ways to predict future runoff, and find other ways, including scenarios to help decision makers grapple with this very different future.

Agriculture will be at the center of additional water shortages in the basin, because of its approximately 70 percent of total water use. Deficit irrigation, rotational fallowing, crop switching, irrigation efficiency all offer opportunities to save water, while keeping Ag. in production. There is much that a coordinated effort, between Interior with WaterSMART and USDA with its Farm Bill, can do to ensure that the harm to Ag. is minimized.

The Salton Sea deserves significant Federal resources. Without a functioning Salton Sea, the Imperial Irrigation District's ability to contribute to a meaningful resolution of the lower basin's over-use

will be seriously constrained. Interior needs to continue to fund our National Streamgage Network. Congress should continue to support existing programs like NOAA's RISA, Interior's Climate Adaptation Science Centers, and the USDA Climate Hubs.

Finally, any solution must aim at the root cause of these temperature-induced flow reductions. The ultimate goal must be net zero greenhouse gas emissions as soon as is practical, ideally net zero by 2050, but no later than 2070. Greenhouse gas reductions must be pursued through a suite of actions, including carbon pricing, investments in technology, tax credits, and other techniques.

In conclusion, climate change is water change, and it is already impacting the Colorado River. My father was a member of this Committee for over 30 years, and he chaired it for 14. This very hearing room is named for him. That generation did not shy away from solving the great problems of its day, including how to provide reliable water supplies for the American Southwest.

Similarly, this generation should not shy away from solving the great problems of today, which include how do we adapt to climate change, and how do we stop it? Climate change threatens all we hold dear. This is especially clear when it reduces our life-giving water supplies.

Climate change is the key threat to 21st century water supply reliability. To minimize this threat we must act now by adapting to the coming changes with smart water management policy, with technology, with science, and also by reducing greenhouse gas emissions as quickly as we can.

Thank you for your time.

[The prepared statement of Mr. Udall follows:]

PREPARED STATEMENT OF BRAD UDALL,[1] SENIOR WATER AND CLIMATE RESEARCH SCIENTIST/SCHOLAR, COLORADO WATER INSTITUTE, COLORADO STATE UNIVERSITY

Chairman Huffman, Ranking Member McClintock, and other members of the panel, thank you for providing me an opportunity to speak on this important issue.

I am a senior scientist at Colorado State University where I study how climate change will affect western U.S. water supplies. For over 15 years, I have published and spoken extensively on the impacts of climate change on western rivers, and how we might reduce those impacts. Today I want to use my time to focus on the Colorado River.

1. THE 21ST CENTURY CLIMATE CHALLENGE FOR THE COLORADO RIVER BASIN

Nineteen years of unprecedented drought in the gaged record have brought the Colorado River basin to the brink of the first ever major water delivery reductions in the Lower Basin. The combined contents of the two largest reservoirs in the United States, Lakes Mead and Powell, are now barely 40 percent full (Figure 1). Last month the U.S. Bureau of Reclamation said that there is a 69 percent chance for the first-ever shortage in 2020 and a 21 percent chance that Lake Mead will be less than 25 percent full in 2023[2] (Figure 2). At this level, the reservoir's ability to supply water to Nevada, California, Arizona and Mexico is at risk.

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[1] In addition to my position at Colorado State University, I am a co-investigator with the DOI Southwest Climate Adaptation Science Center, and a member of the Colorado River Research Group. (www.coloradoriverresearchgroup.org).

[2] January 2019 Projections from Reclamation's Mid-Term Operations Model (MTOM) model here: https://www.usbr.gov/lc/region/g4000/riverops/crss-5year-projections.html. Note that these projections use the full 111 years of historical hydrology (1906–2016) which includes the pluvial at the beginning of the 20th century. The actual risk using some form of 'stress test' hydrology without the wet period would be substantially higher.

Figure 1: Combined Contents of Lakes Powell and Mead 2000 to January 31, 2019.

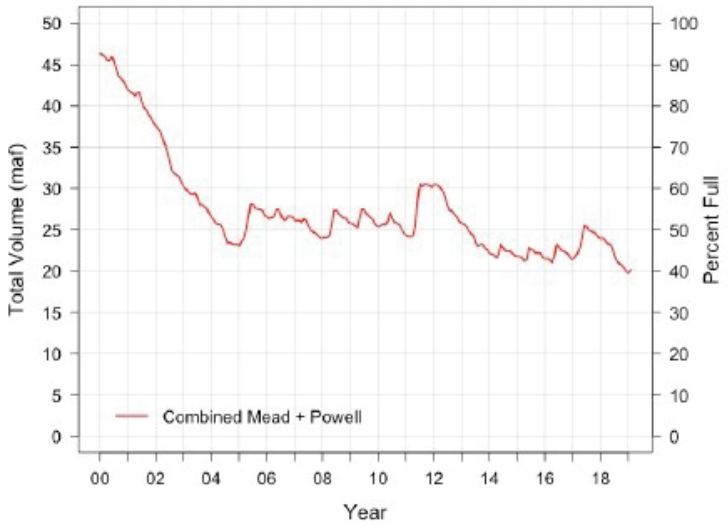


Figure 2: Shortage Probabilities for 2019 to 2023 from Reclamation's January 2019 study.

Percent of Traces with Event or System Condition
Results from January 2019 MTOM/CRSS[1,2,3,4] (values in percent)

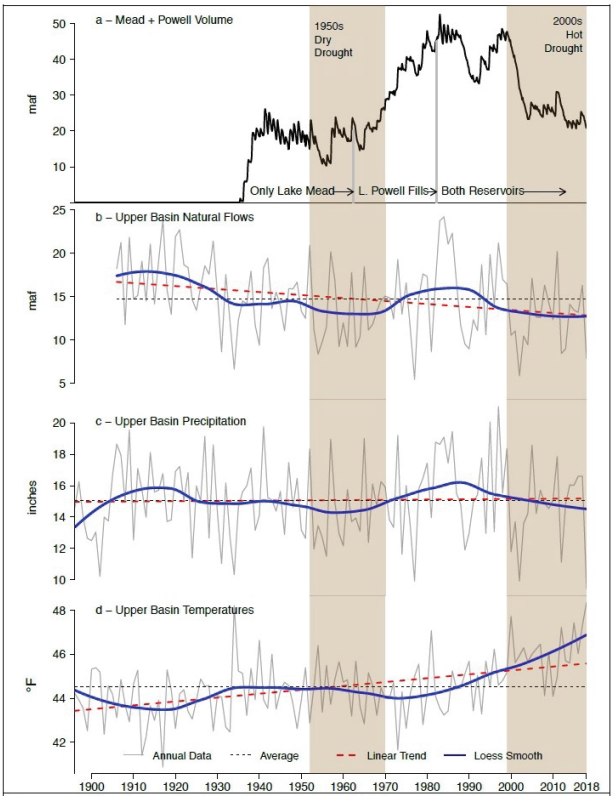
	Event or System Condition	2019	2020	2021	2022	2023
Upper Basin – Lake Powell	**Equalization Tier**	**0**	**1**	**10**	**13**	**17**
	Equalization – annual release > 8.23 maf	*0*	*1*	*10*	*13*	*17*
	Equalization – annual release = 8.23 maf	*0*	*0*	*0*	*0*	*0*
	Upper Elevation Balancing Tier	**100**	**31**	**42**	**48**	**46**
	Upper Elevation Balancing – annual release > 8.23 maf	*43*	*19*	*39*	*44*	*40*
	Upper Elevation Balancing – annual release = 8.23 maf	*57*	*11*	*3*	*4*	*6*
	Upper Elevation Balancing – annual release < 8.23 maf	*0*	*1*	*0*	*1*	*0*
	Mid-Elevation Release Tier	**0**	**66**	**42**	**24**	**22**
	Mid-Elevation Release – annual release = 8.23 maf	*0*	*0*	*0*	*3*	*4*
	Mid-Elevation Release – annual release = 7.48 maf	*0*	*66*	*42*	*21*	*18*
	Lower Elevation Balancing Tier	**0**	**3**	**6**	**15**	**16**
Lower Basin – Lake Mead	**Shortage Condition – any amount (Mead ≤ 1,075 ft)**	**0**	**69**	**82**	**81**	**79**
	Shortage – 1st level (Mead ≤ 1,075 and ≥ 1,050)	*0*	*69*	*50*	*33*	*26*
	Shortage – 2nd level (Mead < 1,050 and ≥ 1,025)	*0*	*0*	*31*	*39*	*31*
	Shortage – 3rd level (Mead < 1,025)	*0*	*0*	*0*	*9*	*21*
	Surplus Condition – any amount (Mead ≥ 1,145 ft)	**0**	**0**	**0**	**1**	**4**
	Surplus – Flood Control	*0*	*0*	*0*	*0*	*0*
	Normal or ICS Surplus Condition	**100**	**31**	**18**	**17**	**17**

[1] Reservoir initial conditions based on December 31, 2019 conditions using the Mid-term Probabilistic Operations Model. MTOM uses the January 4, 2019 unregulated inflow forecast from the CBRFC.
[2] Each of the 35 initial conditions were coupled with 111 hydrologic inflow sequences based on resampling of the observed natural flow record from 1906-2016 for a total of 3,885 traces analyzed.
[3] Percentages shown may not sum to 100% due to rounding to the nearest percent.
[4] Percentages shown may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

RECLAMATION
Managing Water in the Wes

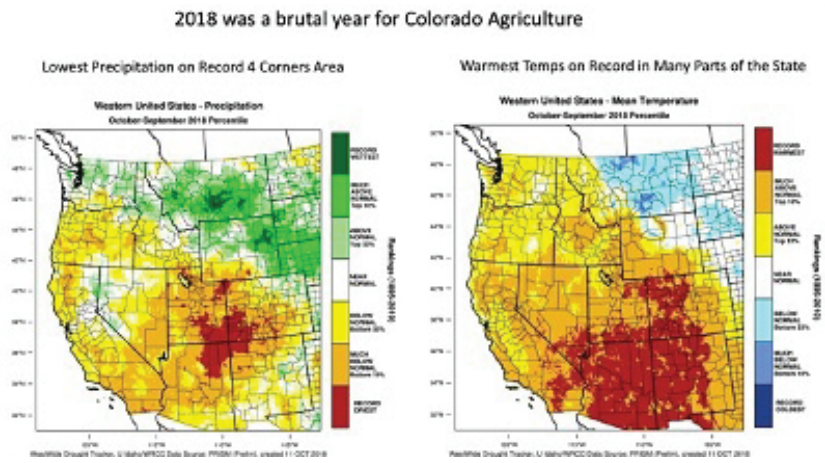
Since 2000 flows have been 19 percent below the 20th century average (Figure 3). 2018 was the hottest and driest year in the 4-Corners region since records were first kept in 1895 (Figure 4). Temperatures in the basin are now over 2° F warmer than the 20th century average, and those temperatures are certain to continue rising. Because the term drought implies a temporary condition, and this 19-year drought has been anything but that, scientists have begun using "aridification" to describe the ongoing hot and dry climate in the basin.[3]

Figure 3: Reservoir Contents, Upper Basin Natural (undepleted) Flows, Precipitation, and Temperature for various periods to end of September 2018.



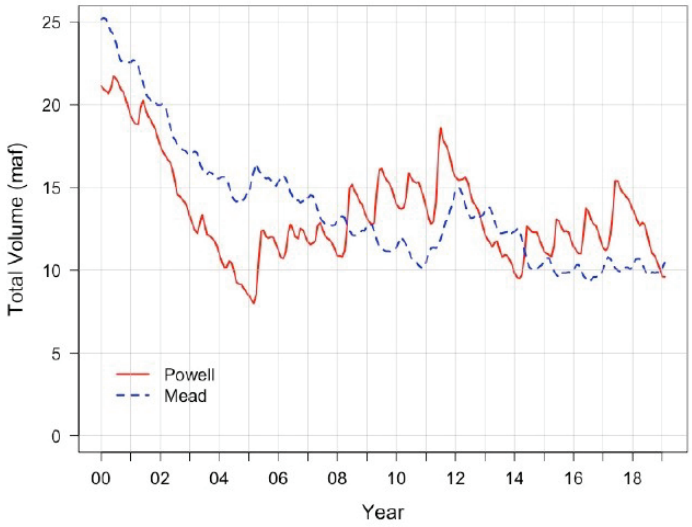
[3] It should be noted that it is possible that the Colorado River may see a decade or more of higher flows in the 21st century—our enhanced water cycle is now capable of generating very large flows. But on balance, the science tells us that over the course of the 21st century the greatest risk is for flow reductions and ongoing aridification.

Figure 4. 2018 was a record setting hot and dry year in large parts of the American Southwest.



In addition to climate change, overuse has also contributed to the problem. Water users in the Lower Basin states consume roughly 10.2 million acre-feet[4] (maf) annually, while inflows from upstream average 9 maf leaving an imbalance of 1.2 maf/year, or about 7 percent of the total flow in the system. This imbalance, known as the "Structural Deficit," along with the low flows, has helped to drive both Lakes Mead and Powell lower (Figures 1 and 5).

Figure 5. Contents in millions of acre-feet of Lakes Powell and Mead, January 1, 2000 to January 31, 2019.



[4] An acre-foot is 1 foot of water depth over an area of 1 acre or about 325,000 gallons. This is enough water for 2 to 4 families per year.

2. THE SALIENCE OF WARMING TEMPERATURES

In 2017, Dr. Jonathan Overpeck[5] and I published a peer-reviewed paper[6] which said that higher temperatures due to climate change had reduced the flow of the Colorado River by approximately 6 percent, and that additional warming could reduce flows by approximately 20 percent in 2050, and up to 35 percent by 2100, should precipitation remain the same.[7] Higher temperatures increase evaporation from soils and water bodies, increase sublimation from snowpacks, and increase water use by plants due to a longer growing season and more warmth on any given day. A thirstier atmosphere which can now hold more moisture due to higher temperatures also contributes to the problem. Given the large 2° F warming in the basin, we called the current period a "hot drought" and the flow losses "temperature-induced flow reductions" to distinguish them from a more normal "dry drought" that causes precipitation-related flow reductions.

Last year Dr. Dennis Lettenmaier,[8] his doctoral student Mu Xiao, and I published another peer-reviewed paper[9] showing that 50 percent of the flow reduction from 2000 to 2014 was due to higher temperatures and the remaining 50 percent was due to shifting precipitation patterns.

Other recent papers have also found significant impacts of temperatures on Colorado River flows[10] and other western rivers. Southwestern U.S. megadroughts—droughts lasting decades-have been shown to be much more likely in the 21st century as it warms, even if precipitation increases.[11]

The 2018 4th National Climate Assessment[12] found that the hydrologic cycle has already been profoundly modified by climate change. In the West, snowpacks are being reduced, snowmelt runoff is occurring earlier in the year, and flows in the fall are lower. More of our precipitation is occurring as rain rather than snow. Previous National Assessments in 2009 and 2014 reported similar results. Studies also note that past hydrology is no longer a suitable guide to future hydrology, a concept sometimes known as the "Death of Stationarity."

It is clear the Colorado River, and the entire Southwest, has shifted to a new hotter and drier climate, and, equally important, will continue to shift to a hotter and drier climate for several decades after we stop emitting greenhouse gasses. Last year humans emitted over 37 billion tons of CO_2, an increase of 2.7 percent over 2017.[13] Given these unprecedented changes to our climate and water supplies, our 20th century water management systems will need fundamental modifications to ensure that humans, our economy, and our environment suffer the least harm from likely future reductions in water supplies.

3. THE DROUGHT CONTINGENCY PLAN (DCP)

The seven Basin states are close to a "Drought Contingency Agreement[14]" that will implement large proactive reductions in deliveries in the basin to protect Lakes Mead and Powell from reaching dangerously low volumes. In the Lower Basin, Central Arizona agriculture will be especially hit hard along with more manageable shortages for Las Vegas and central Arizona municipalities. If flows remain low, California agriculture and municipalities in Southern California will be impacted in future years.

The states, the Central Arizona Project, irrigation districts, NGOs, Indian tribes and others deserve recognition for the hard work needed to agree on very difficult

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[5] Dr. Overpeck is Now Dean of the University of Michigan School for Environment and Sustainability. At the time of the paper he was the Director of the Institute of the Environment at the University of Arizona and the Thomas R. Brown Distinguished Professor of Science.

[6] Udall and Overpeck, 2017, The 21st century Colorado River hot drought and implications for the future.

[7] In the paper these numbers all have ranges on them. The range of current flow reduction was from 3% to 10%; 6% is roughly the mid-point of this range. The range in 2050 was from 8% to nearly 30%, using 3 different temperature sensitivities and a broad range of future emissions. In 2100 the range was from 12% to 55%. In the text above, I round to the middle of these ranges.

[8] Distinguished Professor of Geography at the University of California at Los Angeles.

[9] Xiao, Udall and Lettenmaier, 2018. On the Causes of Declining Colorado River Streamflows.

[10] See Dettinger, Udall, & Georgakakos, 2015; McCabe, et al., 2017; Overpeck & Udall, 2010; Vano, Das, & Lettenmaier, 2012; Vano et al., 2014; Vano & Lettenmaier, 2014; Woodhouse, et al., 2016.

[11] Ault, et al., 2016; Cook, Ault, & Smerdon, 2015.

[12] https://nca2018.globalchange.gov.

[13] https://www.washingtonpost.com/energy-environment/2018/12/05/we-are-trouble-global-carbon-emissionsreached-new-record-high/?utm_term=.874be32b4d7b.

[14] The DCP is actually a set of agreements. https://www.usbr.gov/dcp/.

reductions in water use. And Reclamation has been within its rights to strongly encourage all of the parties to finish these agreements soon.

The agreement is an important first step. To be sure, it significantly reduces the chance of emptying Lake Mead, an event that would prove to be very challenging for the entire Southwest. Most critically, the DCP buys us time to implement more permanent solutions. And on paper the DCP 'solves' the Structural Deficit. It is, however, not perfect. It has mechanisms to account for and repay any shortages should flows later partially refill reservoirs. These paybacks have the potential to put the reservoirs back into precarious territory just when they show signs of recovery. Although the agreement has not been finalized, I am very optimistic that it will be completed soon.

This agreement will only last 7 years. New negotiations will need to begin by the end of 2020 to replace the existing 2007 agreement on shortage sharing and reservoir operations [15] which expires in 2026. Hard issues left unresolved by the DCP will make the coming negotiations even more challenging.

4. THE 2020–2026 NEGOTIATIONS LEADING TO THE 2026 AGREEMENT

In the long term, the Basin states need not just a Drought Contingency Plan, but a Climate Change Plan that accounts for likely future declines in flows. Should flows continue to drop, as the science suggests is likely, additional reductions in consumption will be needed. Agreeing on reductions that cause the least harm to water users, the overall economy and the environment will be an exceedingly difficult task, much harder to come by than those achieved in the DCP. To ensure water reliability in the 21st century, planning for major flow reductions should be the main charge for those leading the negotiations for the new 2026 agreement.

4.1. An Open, Inclusive EIS Process Needed

The negotiations will need a full Environmental Impact Statement including the transparency that such a process requires. (With the exception of Arizona, the DCP process lacked transparency and inclusion.) This process should allow for alternatives supplied by the states, tribes, municipalities, academia, NGOs and others. The 2007 process, for example, incorporated an NGO-sponsored 'Conservation Before Shortage' alternative that provided some of the ideas implemented in the 2007 agreement and later in the DCP. Reclamation should support making modeling tools available to interested parties; modeling allows for thinking with numbers in much the same fashion that writing allows for thinking with words. Without these open access tools, some stakeholders will be unable to fully participate in the process.

4.2. Permanent Structural Deficit Solution Needed and Plans for Extended Low Flows

A permanent solution to the Structural Deficit should be part of the 2026 negotiations. The negotiation also needs to consider how water management will respond to potential future unprecedented low flows that require reductions in additional to those needed to solve the Structural Deficit. The current rules, laws and agreements imply solutions that may lead to litigation, may be undesirable and perhaps even impractical. Rules, laws and agreements around "equalization," who bears the burden of solving the Structural Deficit, and the agreement around the Upper Basin delivery 'obligation' will all need to be considered.

With each passing year, the existing 2007 reservoir rules reduce the possibility of 'equalization releases' from Lake Powell to Lake Mead. It has been these large (e.g., 3–5 maf in 1 year) releases that have allowed the Structural Deficit to persist. The combination of future large temperature-induced flow reductions and the likely continuation of the existing high bar for equalization means that it is very likely that at least 1.2 maf/year of demand will need to be permanently removed from the river in the 2026 agreement with provisions for additional reductions if needed.

Contrary to what the 1968 Colorado River Basin Project Act says, the Central Arizona Project (and to a much lesser degree, Nevada) should not have to bear the entire burden of solving the Structural Deficit. This is because 5m people in Phoenix and 1m people in Tucson rely at least to some extent on this surface water. (Tucson has no surface water, although it does sit atop a large but not infinite supply of groundwater.) This fact has been acknowledged implicitly by inclusion of shortages to California in the DCP. It is extremely likely that additional shared sacrifice by all Lower Basin entities will be needed.

Since 1922, the Lower Basin has relied on Section III(d) of the Colorado River Compact which appears to obligate the Upper Basin to deliver 75 maf every 10 running years as a backstop to future potential low flow conditions. That wording of

[15] https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.

that clause says that the Upper Basin shall not cause the flow to decline below 75 maf. However, if climate change causes those flow reductions, and if the Upper Basin is well under their Compact Section III(a) consumptive use limit as they currently are, the Upper Basin has a strong case to make that Section III(d) does not apply. Were this to occur, the Upper Basin would have been in serious drought for a number of years and its reservoirs would likely be empty. In addition, water to meet such a 'compact call' would come disproportionately from already suffering Upper Basin municipalities including Colorado's Front Range, Albuquerque, and Salt Lake City. This could lead to lengthy litigation, an outcome that would do little to provide either water or an immediate solution. In such a situation, the Lower Basin would need to reduce uses well beyond that needed to solve the Structural Deficit.

4.3. The Tension between Water Conservation to Raise Lake Levels and Later Recovery

Well-meaning existing efforts ("Intentionally Created Surplus" and variants) allowed by the 2007 agreement to prop up Lake Mead with unused conserved water may have an implicit flaw, which is that these waters are accounted for and are later allowed to be withdrawn from the system, potentially at times when the system is more exposed. This year Metropolitan Water District announced plans to withdraw its previously stored water rather than have it stranded by the existing rules which prevent withdrawals at low lake elevations. This is the water management equivalent of a bank run, and without a surefire mechanism of deposit insurance, such untimely withdrawals may happen in the future.

To be sure, these efforts were designed to encourage water conservation and this has occurred. But there remains a tension between encouraging conservation and at the same time allowing the recovery of this water later which actually means that no real conservation occurred—the storer merely shifted water use in time. These water storage efforts allow us to push the problem forward in time, hoping that Mother Nature will rescue us. But they can make low flow years worse, with storing entities desiring to recover these saved supplies during such low years exactly when the reservoirs are bottoming out. Unfortunately, there is no clear way to provide the equivalent of deposit insurance, which in this case would be a supply of emergency water to prop up either the reservoir or the depositor.

These rules might make sense in a system where a reasonable expectation is that a better future will soon occur. In a declining system, however, these rules push difficult decisions to the future when those decisions will be even more challenging. It is not clear how to solve this problem, but at least shedding light on it may help identify solutions.

4.4. Developing Future Hydrology that accounts for Warming and Non-Stationarity

One of the most difficult aspects of water resource management in the era of climate change is that the past is no longer a guide to the future.[16] Current floods and droughts are now routinely exceeding the envelope of the historic record. This makes planning, including probabilistic modeling, very difficult.

Current projections for the future of the basin often use the full range of historical hydrology from 1906 onward to generate probabilities of future delivery reductions. Yet we know these probabilities are understated because of a very wet period at the beginning of the 20th century that will likely not reoccur. In these modeling efforts, the wet years refill reservoirs and bail out the system. In recent years Reclamation has investigated using shorter periods ("stress test hydrology") that remove this wet period and use only the more recent dry period. It is possible that even these efforts understate the future risk. Other work is ongoing to understand the increasing influence of temperature on streamflows, including the physical mechanisms for the uncoupling of runoff from precipitation. Much more work needs to be done.

Reclamation has also been experimenting with future hydrology scenarios that step back from probabilities. These scenario-based efforts attempt to provide plausible futures for decision makers without explicit, overly precise and misleading probabilities. Additional work is needed in this area and Reclamation needs to be given the resources to pursue all of this work. This is a national problem as well.

5. OTHER ACTIONS AND CONSIDERATIONS

5.1. Agricultural Solutions

Agriculture will be at the center of additional water shortages in the basin because of its approximately 70 percent of total water use. The Drought Contingency

[16] Milly et al., "Stationarity Is Dead."

Plan provides money and a plan to replace Colorado River water with groundwater to partially mitigate harm to Arizona irrigators. With potential cuts to locations outside of central Arizona and in California, groundwater is unlikely to be available as a replacement source.

In 2017 Greg Peterson and I published a study [17] on how agriculture might adapt to lower flows. We looked at deficit irrigation of alfalfa, rotational fallowing, crop switching, irrigation efficiency [18] and water conservation. All of these water saving techniques offer the promise of at least some water savings, although each also has distinct costs. Perhaps the most promising of these techniques is switching to less water intensive crops, although it is also the least known and least tried. Crop switching requires growers to change labor, equipment, markets, transportation, storage and more. For crop switching to work, growers will need assistance and assurance that these new products will be financially viable.

There is much the Federal Government can do to assist with such a transformation. The U.S. government should help facilitate all of these techniques through programs at Reclamation such as WaterSMART,[19] and through the Farm Bill. The Department of the Interior and the U.S. Department of Agriculture need to ensure that inter-departmental coordination occurs so that programs can be integrated as much as possible. Given that agriculture will bear much of the brunt of coming reductions, it is imperative that USDA be as active as possible in mitigating the impacts to agricultural users. In addition, Reclamation should consider a broad study to see where its large backlog of infrastructure needs might overlap with opportunities to pursue irrigation efficiency and water conservation.

5.2. The Salton Sea

The Salton Sea stands out as an area of special concern—2017 marked the last year of extra flows into the sea to mitigate transfers to San Diego. It has now begun to decline rapidly, falling 1.7 feet in the past 2 years, threatening both a critical ecological resource and human health in the Imperial and Coachella Valleys. Impacts are already being noted.[20] There are a number of reasonably simple actions that could be taken to resolve problems, and also importantly, to allow future Colorado River problems to be solved. Without a functioning Salton Sea, the Imperial Irrigation District's ability to contribute to a meaningful resolution of the existing Structural Deficit, and additional demand reduction if necessary, will be seriously constrained.

Plans exist to minimize the developing impacts at the sea; what has been missing is resources to implement these ideas. The USGS Salton Sea Science Office needs a full-time director based near the sea. Reclamation could support hydrologic studies, engineering review and general construction management for Salton Sea habitat projects. The U.S. Fish & Wildlife Service Salton Sea Wildlife Refuge should be fully staffed and funded, including money for the Red Hill Bay project.

Despite its size and apparent last minute nature, the Imperial Irrigation District's recent $200m request is reasonable. There is a need for long-term funding for Salton Sea monitoring and O&M which is largely unmet by California's bond funding.

5.3. New Diversions in the Basin

Despite the ongoing aridification and warning signs that the river is overallocated and overused, additional diversions are still being planned in the Basin. Given all that we know, these plans should be delayed or if built only allowed to divert when the harm to existing users will be very low, such as when Lakes Powell and Mead are full or nearly full. With serious shortages already possible, the last thing this basin should consider is additional diversions.

5.4. The Federal Role in Policy

The Federal Government through Reclamation has long played an important role in the basin. Historically, that role has been primarily to build and run the massive infrastructure. In recent years, Reclamation has provided important scientific support to the Basin states in their negotiation of new water agreements. The agency has played a critical convening and process role, while letting the states lead on policy, as is appropriate given state ownership of most water rights. However, when the states fail to lead, Reclamation has rightly threatened, scared and cajoled the

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[17] http://www.cwi.colostate.edu/media/publications/cr/232.pdf.

[18] Improperly done, irrigation efficiency measures can paradoxically increase water consumption. Properly done, irrigation efficiency can provide needed flexibility and save water. See (Grafton et al., 2018; Ward & Pulido-Velazquez, 2008).

[19] https://www.usbr.gov/watersmart/.

[20] https://www.desertsun.com/story/news/2019/02/08/salton-sea-california-fish-bird-die-off-winter/2818025002/.

states back to their proper role. This is as it should be and Reclamation should continue to provide scientific support, management and the appropriate leadership on new water agreements including a willingness to impose solutions if the states are unable or unwilling to make the difficult choices required.

5.5. Science and Data Collection

Interior through the USGS and its partners needs to continue to fund our national stream gage network, and expand that network where scientists and decision makers agree that additional gaging is necessary. To use a navigation analogy, climate change puts us in uncharted territory. With less than complete "maps" of our climate future, we need to make sure that our instruments are working and providing the very best information on our location.

Congress should continue to support existing programs like the NOAA-funded Regional Integrated Sciences and Assessment (RISA) programs, the Department of Interior Climate Adaptation Science Centers (CASC), Reclamation's water science efforts and the USDA Climate Hubs,[21] all of which serve to connect scientists with decision makers so that useful science can be created and understood. These programs have a known track record of knowledge coproduction, which includes the breaking down of barriers between scientists and decision makers. The RISA and CASC programs have been especially good at assessing the state of science for stakeholders. The Climate Hubs are much newer, show great promise with helping agriculture adapt to climate change, but need more resources. Reclamation's scientist-engineers are very talented and deserve recognition and support for moving emerging science into useful engineering.

Note that these actions will have widespread national benefits beyond the Colorado River.

5.6. Greenhouse Gas Reduction Efforts

Finally, any solution set must aim at the root cause of the temperature-induced flow reductions. Climate change is as serious a problem as humans have ever faced and thus requires not one, but a vast set of solutions. The ultimate goal must be net zero greenhouse gas emissions as soon as is practical, ideally with net zero reductions by 2050 but no later than by 2070.[22] This is achievable but will take great leadership. To the extent we fail to do this, we will impose great costs on ourselves, our youth, and especially on future generations. Greenhouse gas reductions must be pursued through a suite of actions including carbon pricing, investments in technology, tax credits, and even thru Climate Smart Agriculture[23] which aims to increase farm yields while sequestering carbon in soil.

6. CONCLUSIONS

Scientists have attributed changes in the global water cycle to human caused climate change including enhanced precipitation in hurricanes like Harvey which dropped 50+ inches of rain in 4 days,[24] record-setting droughts like the one in California from 2012 to 2017,[25] and recent flow declines in the Rio Grande.[26] Climate change is also clearly impacting river flows in the Colorado River, too. Simply put, climate change is water change.

My father was a member of this Committee for over 30 years and chaired it for 14 years. This very hearing room is named for him, and his portrait overlooks us all. His generation, the greatest generation, revered science and the knowledge it provided that allowed us to build the amazing water supply infrastructure that now exists on the Colorado River.

That generation did not shy from solving the great problems of its day, including how to provide reliable water supplies for the American Southwest and how to clean up our environment. My best guess is that in this very room the ground breaking 1968 Colorado River Basin Project Act was passed out of Committee.

Similarly, this generation should not shy away from solving the great problems of today, which include how do we adapt to climate change and how do we stop it. The science on climate change is now 200 years old, and is very, very clear. When

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[21] I have served as the Director of the Western Water Assessment RISA, am a co-investigator for the Southwest Climate Adaptation Science Center and serve as one of Colorado State University's liaisons to the Northern Plains Climate Hub.

[22] These are the recommendations from the recent IPPC 1.5 Degree Special Report.

[23] Colorado State University has a new Climate Smart Agriculture initiative and works with the USDA Climate Hubs. Climate Smart Agriculture was initially conceived by the Food and Agriculture Organization in 2013. See Lipper et al, 2014.

[24] Risser & Wehner, 2017; Trenberth, et al., 2018.

[25] Diffenbaugh, Swain, & Touma, 2015.

[26] Chavarria & Gutzler, 2018.

major oil companies accept the science [27] and say we must act, as they have,[28] the debate should be over. It is over in every other major country.

Climate change threatens all we hold dear—our economic well-being, our culture, our way of life, our environment, our kids and future generations. This is especially clear when it reduces our life-giving water supplies as it is now doing in the Colorado River Basin. Climate change is the key threat to 21st century water supply reliability.

To minimize this threat, we must act now by adapting to the coming changes with smart water management and policy, with technology, with science and also by reducing greenhouse gas emissions as quickly as we can.

Thank you for your time.

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[27] https://www.scientificamerican.com/article/oil-giant-accepts-climate-consensus-denies-responsibility-forwarming/.

[28] https://corporate.exxonmobil.com/en/Energy-and-environment/Environmental-protection/Climate-change; http://reports.shell.com/sustainability-report/2015/energy-transition/addressing-climate-change.html.

Mr. HUFFMAN. Thank you, Mr. Udall. The next witness is Mr. Jonathan Nelson from the Community Water Center, a non-profit environmental justice organization based in California's San Joaquin Valley. The Community Water Center works to ensure that all communities have access to safe, clean, and affordable drinking water. The Chair now recognizes Mr. Nelson to testify.

Welcome, sir.

STATEMENT OF JONATHAN NELSON, POLICY DIRECTOR, COMMUNITY WATER CENTER, VISALIA, CALIFORNIA

Mr. NELSON. Thank you, Chairman Huffman, Ranking Member McClintock, and members of the Subcommittee. My name is Jonathan Nelson. I am the policy director of the Community Water Center, or CWC, an environmental justice organization that works in the southern San Joaquin Valley and central coast of California, whose vision is to ensure that all communities in California and in America can have access to safe, clean, and affordable water, through organizing education and advocacy.

CWC also works as part of national coalitions to address issues related to safe and affordable drinking water supply across America.

At CWC, we believe that access to safe drinking water is a basic human right. Yet, each year, millions of Americans are impacted by unsafe water supply, including more than 1 million in California. The data shows toxic drinking water disproportionately impacts low-income communities of color. Access to safe drinking water supply is a public health crisis, and it is happening under our watch.

With this as quick background, I would like to offer two points at the intersection of climate change and water supply.

First, climate change is already hurting access to safe water supply in our communities. Climate science is clear that droughts have the potential to become more frequent, longer, and more severe. We saw that during the recent historic drought in California, where over 10,000 Californians were impacted by loss of water supply.

Communities like East Porterville, which had already faced inequitable development and contaminated water, went dry as farmers increasingly tapped into groundwater at unsustainable rates, resulting in a reality where low-income communities simply could not afford to chase the falling groundwater table. It was a human catastrophe. Just imagine going home at the end of today and not having water in your house, and having to have your family rely on portable community showers and tanked water.

What is worse, Stanford has documented the negative relationship between stressed water supply and water quality. The takeaway is that climate change and more severe droughts are the new normal, and we cannot look at issues of water supply and water quality in isolation; they are fundamentally connected.

The second point I would like to offer is to take proactive action now to protect water supply for our most vulnerable communities before the next water shortage crisis hits. CWC has worked with others in California to recently pass proactive drought preparedness legislation that would require more advance drought emergency planning, and that also requires the state of California to

proactively identify communities that may be at risk of future water supply shortage in the event of a drought.

CWC is also working to implement legislation that requires better stewarding of our precious groundwater resources, to make sure that they last for future generations.

Finally, as already has been pointed out, we need far greater levels of Federal investment, which has shrunk dramatically in recent decades. These are just some of the actions that we can take to avoid another climate-caused water catastrophe, and we would like to work with this Congress in taking action before it is too late.

To close, we believe that access to safe and affordable drinking water is a basic human right. Yet, millions are impacted by toxic water each year. This is not an abstract issue, if you live in one of these impacted communities, and it is only going to get worse as we move forward into a new normal of climate change. Climate change is going to only accelerate the challenges, but we can take action now to protect our communities. So, we urge Congress to act. Thank you.

[The prepared statement of Mr. Nelson follows:]

PREPARED STATEMENT OF JONATHAN NELSON, POLICY DIRECTOR, COMMUNITY WATER CENTER, VISALIA, CALIFORNIA

INTRODUCTION AND BACKGROUND ON COMMUNITY WATER CENTER

Chairman Huffman, Ranking Member McClintock, and members of the Subcommittee, thank you for the opportunity to present testimony as part of this informational hearing.

My name is Jonathan Nelson and I am the Policy Director of the Community Water Center. I am here today to share with you information and our perspective on the challenges and solutions regarding access to safe drinking water supply in California, and particularly in California's San Joaquin Valley and Central Coast regions.

As background, the Community Water Center is an Environmental Justice nonprofit founded in 2006 and headquartered in Visalia, California, in the Southern San Joaquin Valley. The vision of the Community Water Center, or CWC, is to ensure all communities have access to safe, clean, and affordable water. CWC works as a catalyst for community-driven water solutions through organizing, education, and advocacy in California's San Joaquin Valley and Central Coast. We build grassroot capacity to address water challenges in small, rural, low-income communities and communities of color, and also engage on statewide drinking water policy. CWC also works as part of national coalitions to address issues related to safe and affordable drinking water across the country.

In our view, those directly impacted by water contamination must lead in creating and advocating for solutions. At CWC, we strive to reduce barriers that prevent impacted residents from participating effectively in decision making, and we firmly believe that in order to solve California's drinking water crisis, all stakeholders must have a seat at the table.

BACKGROUND ON OUR DRINKING WATER CRISIS

At CWC, we believe that access to safe drinking water is a basic human right, not a privilege. Yet each year millions of people across the country depend on drinking water systems that serve unsafe water [1] and in California alone more than 1 million Californians are exposed to unsafe drinking water from the taps in their

[1] Maura Allaire et al., National trends in drinking water quality violations, 115 Proc. Nat'l Acad. of Sci., U.S. 2078, 2078 (2018), https://perma.cc/Y9FU-SC7C ("[I]n 2015, nearly 21 million people relied on community water systems that violated health-based quality standards.") (this number only includes those who rely on water systems and not on private domestic wells).

homes, schools, and communities.[2] Although water problems exist statewide in California, they disproportionately impact low income communities and communities of color.[3]

California's San Joaquin Valley and Central Coast, where we organize in, is particularly impacted. The San Joaquin Valley alone hosts some of the most contaminated water basins in the nation,[4] yet nearly 95 percent of San Joaquin Valley residents rely on groundwater for their domestic needs.[5] This results in the San Joaquin Valley having the highest rates of drinking water contamination and the greatest number of public water systems with Maximum Contaminant Level (MCL) violations in the state.[6]

In addition to the acute health risks associated with the Central Valley's and Central Coast's water contamination, communities face the disproportionate economic burden that stems from a lack of basic urban water infrastructure. Residents are often forced to pay twice for water, having to purchase bottled water to supplement the unsafe tap water delivered to their homes. These drinking water costs alone can amount to as much as 10 percent of a household's income.[7] In other words, those most affected by the lack of safe water are also those least able to afford the extra cost of alternative water sources.

Droughts and other water supply stressers only exacerbate the challenge. California has recently emerged from the most severe drought in the state's recorded history. Thousands of wells went dry, which forced communities and residents to turn on old, contaminated back-up wells or rely on emergency drinking water supplies like trucked water or bottled water. For a long time, many residents were filling buckets from their neighbors' water hoses in order to have enough water for basic sanitation. And we still have communities and private well owners whose wells remain dry years later.

Finally, the communities most impacted by unsafe drinking water were for decades continuously and deliberately excluded from full participation in their local water decision-making governance. And still today there are challenges in ensuring adequate participation by local communities in water governance.

We know through experience that if you give communities a seat at the table, and empower them with the information they need, that they can meaningfully participate in the decision-making process—and that the solutions that result will better reflect the needs of communities.

SOLUTIONS TO SECURE SAFE DRINKING WATER SUPPLY FOR VULNERABLE COMMUNITIES IN THE FACE OF CLIMATE CHANGE

I would like to spend the remainder of my remarks today outlining a few areas of need at the intersection of climate change and access to safe drinking water supply.

The first point is acknowledging that climate change is already having a direct impact on access to safe drinking water supply for vulnerable communities.

The California community of East Porterville was severely and disproportionately impacted during the 2011–2017 drought. East Porterville is an unincorporated community of around 7,000 people in Tulare County, California. Up until recently, due to inequitable development patterns, nearly all East Porterville residents were served by private domestic wells. As many as 300 wells were reported dry over the drought years of 2014 and 2015. What is worse, many wells in the area had tested positive for nitrates, a dangerous contaminant. As surface water deliveries diminished, farmers increasingly tapped into groundwater at unsustainable rates. This resulted in plummeting groundwater levels, causing land subsidence and a reality

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[2] https://www.politifact.com/california/statements/2019/feb/14/gavin-newsom/true-more-million-californians-dont-have-clean-dri/.

[3] http://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/52/attachments/original/1394398105/Balazsetal_Arsenic.pdf?1394398105.

[4] Exceedance/Compliance Status of Public Water Systems, Cal. Water Bd., https://perma.cc/CF55-6XYW (last visited October 13, 2018, 2 PM),; Eli Moore et al., The Human Costs of Nitrate-Contaminated Drinking Water in the San Joaquin Valley 11 (2011), https://perma.cc/67GX-3ASC.

[5] Carolina Balazs et al., Social Disparities in Nitrate-Contaminated Drinking Water in California's San Joaquin Valley, 119 Envtl. Health Persp. 1272, 1273 (2011), https://perma.cc/JX8V-DHXC.

[6] http://waterboards.ca.gov/water_issues/programs/hr2w/index.shtml.

[7] http://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/52/attachments/original/1394397950/assessing-water-affordability.pdf?1394397950.

where low-income communities could not afford to keep drilling to chase the falling groundwater table—causing domestic and shallow municipal wells to go dry.

In response, CWC worked collaboratively with both local and state government to address what had become a grave public health crisis. The solution involved both interim and long-term drinking water solutions. The interim measures included emergency bottled water, water tanks, and portable showers—however these band-aid measures came at great financial cost to the state of California, an estimated $633,500 per month just for East Porterville—that's $7.6 million per year.[8] The long-term solution involved a consolidation for residents on domestic wells into the city of Porterville's water system. CWC conducted large-scale community outreach to ensure residents understood their options and what to expect if they chose to connect to the city of Porterville's water system. Since then, more than 700 East Porterville homes have been connected to the city of Porterville's public water system and now have a source of safe and reliable water for years to come.

Unfortunately East Porterville was not an isolated incident. In 2014, USDA granted more than $4 million in emergency funding to 11 public water districts in Tulare County alone to address water supply shortfalls.[9] Over 10,000 Californians suffered inadequate access to water supply during the drought.[10] Most of these Californians resided in low-income communities of color that at worst had experienced historic discrimination and at best insufficient levels of funding investment. Climate change science tells us there will be more East Porterville type emergencies in the future, as droughts become more frequent, longer, and more severe. It is not a question of if the next drought strikes, but when.

The East Porterville story also illustrates what real solutions look like—in this case, funding to support consolidation of households to a nearby water agency that still had access to water, coordination between multiple levels of government, engagement with community-based organizations. These solutions will continue to be needed as we grapple with a new normal at the intersection of climate change, drought, and our most vulnerable communities.

Finally, it is worth noting the relationship between water supply and water quality, which is often not talked about. We repeatedly found increased challenges with water quality in California's Central Valley due to the drought and the resulting (even more) stressed water supply as the composition of the aquifers changed. 6Stanford University has recently released a study[11] documenting the negative relationship between stressed water supply and water quality in the aquifers. The takeaway is we cannot look at issues of water supply and water quality in isolation—they are fundamentally connected.

The second point is around proactively building resilient drinking water institutions, particularly in our most vulnerable and disadvantaged communities, in order to secure a safe and affordable water supply in the face of climate change.

What do we mean by building resilient drinking water institutions? To us, resilient drinking water institutions are those that have the capacity to provide safe drinking water both now and for the long term, in the face of complex challenges such as resulting from water contamination, over-depletion of groundwater sources, and stressors like population growth—and perhaps most critically, climate change.

There are a number of actions we are pursuing in California to better prepare for when the next drought hits, so that we never again subject so many to such horrific conditions. In addition to responding to the real-time impacts of climate change and drought emergencies, CWC has worked over the last few years to pass proactive drought preparedness legislation. For example, CWC worked collaboratively with numerous other organizations to put forward legislation in 2017, California Assembly Bill 1668, that would require certain planning measures to be taken before a drought hits so that we can build more resiliency ahead of time for our most vulnerable communities. Importantly, the legislation would (1) require the state of California to work with the appropriate water and government stakeholders to develop recommended guidelines for drought and water shortage contingency planning/emergency response, and (2) proactively identify communities that may be at risk of water shortage in a future drought. This is just one example of policies we

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[8] https://water.ca.gov/-/media/DWR-Website/Web-Pages/What-We-Do/Emergency-Management/Files/East-Porterville/East-Porterville_Feasibility-Study_Public-Draft_Rev_060316-1.pdf—pg. 35.

[9] https://www.visaliatimesdelta.com/story/news/local/2014/07/28/tulare-county-gets-million-drought-help/13266557/.

[10] State of California Household Water Supply Shortage Reporting System.

[11] https://news.stanford.edu/press-releases/2018/06/05/overpumping-groundwater-increases-contamination-risk/.

are pursuing in California to build resiliency for our most vulnerable communities in response to a future of increased climate change and drought.

Another important effort in California to prepare for a future of climate change and increased drought is to better steward our precious groundwater sources. In 2014 California passed legislation, the Sustainable Groundwater Management Act or SGMA, to address a reality of over-pumping of groundwater aquifers that directly contributed to so many vulnerable Californians losing access to water during the drought. SGMA requires the creation of Groundwater Sustainability Agencies and Plans in order to achieve sustainability of groundwater use while protecting the needs of communities and drinking water. SGMA is still in the early stages of implementation and we have serious concerns that the interests of small communities are being overshadowed or even ignored by larger, more powerful interests. That said, SGMA does at least offer a pathway toward greater sustainability of how groundwater is used—so that it can be preserved and stewarded for the generations to come.

Most importantly it must be noted that lasting change must start within the community and has to be sustained by the community. We must ensure that both funding processes and planning processes allow for meaningful community engagement, not just a rubber stamp, so that solutions can best reflect their needs.

Finally, we need to acknowledge that we need far greater levels of Federal investment. A recent California State Water Board report found that "the percentage of federal support in the total public spending on infrastructure for water utilities has fallen from over 30% in the 1970s to less than 5 percent in 2015." [12] Congress must invest more into ensuring access to a safe and affordable drinking water supply if we are ever to secure every American's basic human right to water in our country.

CONCLUSION

To reiterate, we believe that access to safe, clean and affordable drinking water is a basic human right. Securing this basic human right for everyone in the United States is within reach if we muster the political will and back it with the necessary funding investments. The need is more urgent than ever in the face of climate change, which is accelerating the set of challenges to ensuring universal access to a safe and affordable water supply. We urge Congress to act.

Thank you again for the opportunity to present as part of this hearing, and please do not hesitate to reach out if we can be a further resource or of assistance.

Thank you.

Mr. HUFFMAN. Thank you, Mr. Nelson. Next we will recognize Mr. Tony Willardson, who serves as the Executive Director of the Western States Water Council. The Council is appointed by the 18 Republican and Democratic governors of the western states to work on water policy issues.

Thank you for being here, Mr. Willardson. The Chair now recognizes you for 5 minutes.

STATEMENT OF TONY WILLARDSON, EXECUTIVE DIRECTOR, WESTERN STATES WATER COUNCIL, MURRAY, UTAH

Mr. WILLARDSON. Thank you, Chairman Huffman and Ranking Member McClintock, and other members of the Subcommittee. We appreciate the opportunity to testify on positions that the Council has adopted. I would point out that we are a government entity. We are an instrumentality of each and every participating state, which includes the 17 reclamation states and Alaska.

A secure water future is increasingly uncertain, due to a number of factors. This includes limited data regarding water supply, as well as demands in existing uses; unpredictable climate extremes, such as drought; aging and often inadequate infrastructure;

[12] https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/assistance/docs/2019/draft_report_ab401.pdf.

competing and poorly defined water rights; changing values and regulatory requirements; and integrated collaborative and grass roots approaches needed to water resources management. And this is going to require stronger cooperation that transcends geographical boundaries between states, Federal agencies, tribes, and local communities.

Emphasizing, obviously, from our state perspective, the states have a primary responsibility for water resources management. But also we strive to cooperate with national, regional, local, and tribal entities with their responsibilities and seek cooperation, rather than conflict and litigation.

Water data is an area where we need to place a high priority. There are many vital water data programs, but in 2007, the National Science and Technology Council simply stated that quantitative knowledge of U.S. water supply is currently inadequate. That remains the case.

Here, this Committee has jurisdiction over the USGS and their Groundwater and Streamflow Information Program, over the National Water-Quality Assessment and water use data, as well as land imaging and thermal infrared imaging with Landsat. And I mentioned the Bureau of Reclamation's Agrimet weather station network, as well.

We need to invest more in the water data that is critical for decision making. The Council supports state and Federal applied research and hydroclimate data collection programs that assist water agencies at all levels of government to adapt to climate variability, and make sound scientific decisions. Future decision making will depend on our ability to understand, monitor, predict, and adapt to climate variability. It has serious consequences, as has been described.

The Council also supports Reclamation's drought response program, as well as other Federal programs, including the National Integrated Drought Information System. I co-chair the executive council for NIDIS. It is a recurring threat, and NOAA estimates between 2015 and 2017, it cost this country $11 billion. We need to improve our ability to observe, understand, model, predict, and adapt to variability.

And the Bureau of Reclamation has a rule here, as well, and particularly given their interest in forecasts as part of reservoir operations. Seasonal to sub-seasonal forecasting is an area where we need a better understanding of hydro-climatic processes, dynamical earth system modeling, and probabilistic outlooks of climate extremes. We need to improve our western observing systems as it relates to extreme events.

The Council also supports integrated energy and water program and project planning. We enjoy diverse and abundant energy resources in the West that include renewable and non-renewable. We need to maintain adequate and sustainable supplies of clean water and energy, which are inter-related challenges.

And I would also mention the Council supports hydropower development, a reasonable development that includes protecting our environmental resources, consistent with the state's authority under the Clean Water Act section 401. Hydropower is a vital part of our energy portfolio.

I had mentioned briefly infrastructure and the challenges that we face there with the aging infrastructure. Many have exceeded their design life. Inadequate and untimely funding is increasing those costs. The Council particularly supports funding for rural water projects, many of which have been unfunded, as well as for tribal water projects.

And I would conclude by mentioning the importance to us of using the Reclamation Fund, which was created by Congress in 1902 with revenues and receipts from water and power sales, from Federal land sales, from mineral leasing and oil and gas revenues to fund these kinds of projects. Currently, the unobligated balance is nearly $16 billion, and that money has been spent for other Federal purposes, contrary to the original intent of Congress.

Thank you for the opportunity to testify.

[The prepared statement of Mr. Willardson follows:]

PREPARED STATEMENT OF TONY WILLARDSON, EXECUTIVE DIRECTOR, WESTERN STATES WATER COUNCIL

INTRODUCTION/VISION STATEMENT

Chairman Huffman, Ranking Member McClintock and members of the Subcommittee: My name is Tony Willardson and I am the Executive Director of the Western States Water Council (WSWC). The Council is a bi-partisan government entity created by western governors in 1965 as a policy advisory body representing 18 western states. Our members are appointed by their governors, and we have a small staff located in Salt Lake City, Utah.

My testimony is based on our existing policy position statements covering many water issues that fall under the jurisdiction of the Subcommittee and Committee. All our policy positions are available online at www.westernstateswater.org/policies-2/.

Water is an increasingly scarce and precious resource and should be a public policy priority. In the West, water is critically important to our public health, economy, food security, environment, and western way of life. We must cultivate a water conservation ethic through greater understanding of, and appreciation for, water's value.

Population growth, competing economic and ecological demands, and changing social values have stressed surface and groundwater supplies in many areas. As a result, the number and complexity of conflicts among users and uses is increasing. A secure water future is becoming increasingly uncertain. Numerous factors contribute to the uncertainty, including our unpredictable climate, aging and often inadequate infrastructure, data limitations regarding water supplies and demands, competing or poorly defined water rights, and a constantly evolving regulatory landscape.

An integrated, collaborative, and grassroots approach to water resources management is essential to ensure an adequate, secure and sustainable supply of water of suitable quality to meet our diverse economic and environmental needs now and in the future. This will require stronger collaboration and cooperation that transcends political and geographic boundaries between states, Federal agencies, tribes, and local communities. We should work together to identify water problems and develop optimal solutions at the lowest appropriate level of government. Striving for cooperation rather than conflict and litigation, we must recognize and respect national, state, regional, local and tribal differences in values related to water resources.

The States' primary stewardship over water resources is fundamental to a sustainable water future. Federal water planning, policy development, regulation, protection, and management must recognize, defer to, and support state water laws, plans, policies, and programs, as well as state water rights administration, adjudication and regulation, compacts and settlements. Rather than attempt to dictate water policy, the Federal Government should engage states early in meaningful consultation—avoiding, or at least minimizing, the need for Federal regulatory mandates. Further, the Federal Government should contribute its fair share of funding in support of Federal obligations and objectives that may be implemented as part of state water planning, management, and protection programs and projects.

A secure and sustainable water future will be determined by our ability to maintain, replace, expand and make the most efficient use of critical water infrastructure. We must preserve and improve existing infrastructure, as well as encourage and support innovative water supply strategies and new storage options to better balance supplies with demands.

All levels of government must prioritize the collection, analysis and open sharing of reliable data regarding water availability, quality, and usage given its importance to research for sound science and data driven decision making.

WATER DATA

The Western States Water Council urges the Congress and the Administration to give a high priority to the allocation and appropriation of sufficient funds for vital water data programs, which benefit so many, yet have been, or are being allowed to erode to the point that it threatens the quantity and quality of basic water data provided to a myriad, growing and diffuse number of decision makers and stakeholders, with significantly adverse consequences. (WSWC Position #428, October 26, 2018)

This includes the Bureau of Reclamation's Agrimet network of weather stations and similar networks that provide data used for improving agricultural water use efficiency and ground-truthing, calibrating and validating remote-sensing platforms such Landsat. (WSWC Position #418, March 14, 2018)

Quoting from a 2007 National Science and Technology Council report, A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States, September 2007: "Many effective programs are underway to measure aspects of our water resources. However, simply stated quantitative knowledge of U.S. water supply is currently inadequate. A robust process for measuring the quantity and quality of the Nation's water resources requires a systems approach. Surface water, groundwater, rainfall, and snow-pack all represent quantities of water to be assessed and managed—from the perspectives of quantity, quality, timing, and location."

Sound decision making demands accurate and timely data on precipitation, temperature, evapo-transpiration, soil moisture, snow depth, snow water content, streamflow, groundwater, water quality and similar information.

The demands for water and related climate data continue to increase, and this information is used by Federal, state, tribal, and local government agencies, as well as private entities and individuals to: (1) forecast flooding, drought and other climate-related events; (2) project future water supplies for agricultural, municipal, and industrial uses; (3) estimate streamflows for hydropower production, recreation, and environmental purposes, such as for fish and wildlife management, including endangered species needs; (4) facilitate water management and administration of water rights, decrees, and interstate compacts; and (5) design and construct resilient water infrastructure projects.

Without timely and accurate information, human life, health, welfare, property, and environmental and natural resources are at considerably greater risk of loss. Data gathering and analysis needs transcend administrative agency boundaries and congressional committee jurisdiction requiring collaboration. State-of-the-art technology has been and is being developed to provide real or near real-time data in formats that can be shared and used by different computer programs with the potential to vastly improve the water-related information available to decision makers in natural resources and emergency management, and thus better protect the public safety, welfare and the environment.

Vital information is gathered and disseminated through a number of important Federal programs that provide useful products to assist in visualizing and interpreting data on water and snow, making water supply and availability information more accessible, and easy to interpret.

These include, but are not limited to: (1) the Snow Survey and Water Supply Forecasting Program, administered by the National Water and Climate Center (NWCC) in Portland, Oregon, and funded through USDA's Natural Resources Conservation Service (NRCS); (2) NWCC's Soil and Climate Analysis Network (SCAN); (3) the U.S. Geological Survey's (USGS) Groundwater and Streamflow Information Program (GWSIP) and National Streamflow Network, which are funded through the Department of the Interior; (4) Landsat thermal data, archived and distributed by the USGS, and other remotely sensed data acquired through the National Atmospheric and Space Administration (NASA) and its water-related missions; (5) the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service and Climate Programs Office; and (6) the Environmental

Protection Agency's National Environmental Information Exchange Network (NEIEN).

Over many years, the lack of capital investments in water data programs has led to the discontinuance, disrepair, or obsolescence of vital equipment needed to maintain existing water resources related data gathering activities. There is a serious need for adequate and consistent Federal funding to maintain, restore, modernize, and upgrade Federal water, weather and climate observation programs, not only to avoid the loss or further erosion of critical information and data, but also to address emerging needs, with a primary focus on coordinated data collection and dissemination.

CLIMATE ADAPTATION

The Council supports state and Federal applied research and hydroclimate data collection programs that would assist water agencies at all levels of government in adapting to climate variability and making sound scientific decisions. (WSWC Position #421, March 14, 2018)

Climate variability has serious potential consequences for water supply availability, water resources planning and management, water rights administration, flood management, and water quality management. Further, much of the West's water infrastructure was designed and constructed prior to our current understanding of climate variability, often from short hydrologic records from the first half of the 20th century. The impacts of climate variability can include increased frequency and intensity of severe weather (droughts and floods), reduction of mountain snowpacks, changes in timing and amount of snowmelt runoff, and changes in plant and crop evapotranspiration resulting in changed water demand patterns.

Climate variability leads to additional stress on western water resources, which are already challenged by population growth, competition for scarce resources, increasingly stringent environmental regulations, and other factors. Water resources planning and management at all levels of government and sound future decision making depend on our ability to understand, monitor, predict, and adapt to climate variability. The Council has over the years co-sponsored several workshops to gather input on climate adaptation and research needs, including research on extreme events. These workshops and various Federal reports have helped in identifying knowledge gaps, research needs, opportunities to improve planning capabilities, and other activities that would assist in climate adaptation including those that could impact water quality and thus, available water supply.

Applied research needs and improvements to water resources planning capabilities include subjects such as evaluation of modifications to reservoir flood control rule curves, evaluation of the adequacy of existing Federal hydroclimate monitoring networks, improvements to extreme precipitation observing networks and forecasting capabilities, development and improvement of applications for remote sensing data (satellite imagery), preparation of reconstructed paleoclimate datasets for drought analyses, and development of new guidelines for estimation of flood flow frequencies.

DROUGHT PREPAREDNESS

The Council supports the Bureau of Reclamations Drought Response Program, as well as other Federal programs including, but not limited to, the National Integrated Drought Information System (NIDIS), under the National Oceanic and Atmospheric Administration (NOAA), and other programs designed to improve our forecasting and response capabilities. Further, the Council urges and encourages the Congress and the Administration to assess and consider the need for a comprehensive national drought preparedness and response program on par with Federal efforts to address natural disasters such as hurricanes, tornadoes, floods and similar extreme events. (WSWC Policy Position #430, October 26, 2018)

Since its inception the Council has been actively involved in national drought preparedness, planning and response, as well as related policy and program development and implementation. Drought is a recurring threat. According to the National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information, from 2015–2017, economic losses due to drought have been estimated at $11.1 billion.

The Bureau of Reclamation's current Drought Response Program supports a proactive approach to drought and provides financial assistance to water managers and users via its WaterSMART program to: (1) develop drought contingency plans; (2) implement drought resiliency projects to build the capacity of communities to mitigate and respond to drought—increasing the reliability of water supplies,

improving water management and operational flexibility, facilitating voluntary sales, transfers or exchanges of water, and providing benefits for fish and wildlife and the environment; and (3) undertake emergency actions to minimize losses due to drought through temporary construction activities and other activities, including water purchases and the use of Reclamation facilities to convey and store water.

The Council strongly supports legislation to permanently authorize Title I activities under the Reclamation States Emergency Drought Relief Act and provide adequate appropriations to meet priority needs and continue the Reclamation Drought Response Program. There is a continuing need for making permanent the temporary authority allowing Reclamation the flexibility to continue delivering water to meet authorized project purposes, meet environmental requirements, respect state water rights, work with all stakeholders, and provide leadership, innovation, and assistance.

There is a need for maintaining and improving existing monitoring networks that help provide drought early warning signals, as well as for tracking the impacts of drought. There is a continuing need for developing new monitoring technologies, such as remote sensing, that provide more timely data on water availability and better spatial coverage for assessing water supplies and drought impacts. The collection of basic monitoring data on streamflow, snow pack, groundwater levels, and weather and climate data are essential to understanding water availability and interpreting the early signs of drought. (WSWC Position #429, October 26, 2018)

SUBSEASONAL AND SEASONAL FORECASTING

The Council urges the Federal Government to support and place a priority on research to improve subseasonal to seasonal (S2S) forecasts and research related to extreme events, including research on better understanding of hydroclimate processes, paleoflood analysis, design of monitoring networks, and probabilistic outlooks of climate extremes. Further, the Council supports development of an improved observing system for Western extreme precipitation events such as atmospheric river storms, as well as baseline and enhanced stream, snow and soil moisture monitoring capabilities.

Western states experience great subseasonal, seasonal, and annual variability in precipitation, with serious impacts and consequences for water supply planning and management, drought and flood preparedness and response, water rights administration, operation of water projects, and aging water infrastructure. Sound decision making to protect life and property by reducing flood risks and to inform decisions involving billions of dollars of economic activity for urban centers, agriculture, hydropower generation, and fisheries depends on our ability to observe, understand, model, predict, and adapt to precipitation variability on operational time scales ranging from a few weeks to a season or more. Investments in observations, modeling, high-performance computing capabilities, research and operational forecasting of precipitation provide an opportunity to significantly improve planning and water project operations to reduce flood damages, mitigate economic and environmental damages, and maximize water storage and water use efficiency. (WSWC Position #399, April 14, 2017)

The Federal Government should place a priority on continuing Federal research to develop new and improved predictive capabilities for precipitation at subseasonal to seasonal time scales (as described in the report to Congress prepared by NOAA pursuant to Title II of PL 115–25). Our present scientific capability for forecasting beyond the weather time domain—beyond the 10-day time horizon—and at the subseasonal to interannual time scales important for water management is not skillful enough to support water management decision making. The Council has sponsored a number of workshops on hydroclimate data and extreme events, to identify actions that can be taken at planning to operational time scales to improve readiness for extreme events. Multiple approaches have been identified at these workshops that could be employed at the planning time scale, including ensembles of global circulation models, paleoclimate analyses, and improved statistical modeling, to improve flood frequency analysis and/or seasonal forecasting. (WSWC Position #407, June 29, 2017)

Advances in forecasting research, such as the hydrometeorological testbed program on West Coast atmospheric rivers, demonstrate the potential for improving extreme event forecasting at an operational time scale. The Federal Government should sustain and expand its Hydrometeorology Testbed-West program, in partnership with states and regional centers, to build upon the initial progress made in that program for developing and installing new technologies for precipitation observations.

The responsibility for operational weather forecasting rests with the National Weather Service (NWS), but improvements through Forecast Informed Reservoir Operations (FIRO) is also of particular interest to the Bureau of Reclamation and U.S. Army Corps of Engineers, which can also contribute to this effort.

INFRASTRUCTURE FINANCING

The Council supports appropriate Federal investments in water infrastructure projects and programs that provide jobs and economic security, while protecting the environment—as well as dedicated Federal water infrastructure funding. (WSWC Position #419, March 14, 2018)

The West and the Nation depend on an intricate and aging system of weirs, diversions, dams, reservoirs, pipelines, aqueducts, pumps, canals, laterals, drains, levees, wells, stormwater channels, and water and wastewater treatment and hydroelectric power plants. Maintaining and delivering sufficient supplies of water of suitable quality is key to maintaining the Nation's and the West's economic prosperity, meeting our environmental needs, and sustaining our quality of life, both now and in the future. Appropriate water-related infrastructure investments ensure our continued ability to store, manage, conserve, and control water during both floods and droughts—as well as protect and treat our water resources. Existing and new infrastructure is critical to meet drinking water, wastewater treatment, irrigation, hydropower, flood control, interstate compact, tribal and international treaty, fish and wildlife habitat needs.

Water infrastructure in the West is financed and maintained under a complex network of state, tribal, local, private, and Federal ownership, benefiting a broad segment of water users and other stakeholders. Aging water infrastructure has deteriorated—due to underfunded and deferred maintenance, repair, and replacement needs—and in many cases has exceeded its useful life span, raising public health and safety issues, risking loss of life and threatening public and private property. Inconsistent, inadequate, and untimely funding increases project construction and financing costs, as well as risk, including the failure of critical infrastructure. Substantial and sustained investments in water project construction, maintenance, rehabilitation and replacement is necessary and pays long-term dividends to the economy, public health and safety, and the environment. The Council supports appropriate infrastructure asset management and capital budgeting.

Existing Federal, state and local programs to publicly finance water-related infrastructure projects are crucial, but insufficient to meet water quality and water resources management challenges related to future growth, including municipal, industrial, agricultural, environmental, and energy needs. Water infrastructure systems require ongoing, thoughtful investments to account for life cycle costs, and should be managed with planned retirement or replacement in mind.

The Federal Government has a significant role to play in financing and cost-sharing for water-related infrastructure given Federal economic and environmental objectives, Federal tribal trust and treaty obligations, other past commitments, and Federal regulatory mandates. Federal financial resources are limited, and many authorized Federal water infrastructure projects have not been started or remain incomplete for decades due to inconsistent, incremental, or insufficient appropriations; permitting and licensing backlogs; duplicative environmental reviews; litigation delays; and oversight by multiple Federal agencies without adequate interagency coordination.

Further, current Federal budget scoring guidelines assess the full cost of infrastructure investments up front, while disproportionately discounting long-term economic, public health and safety, and environmental benefits—sometimes making new water project investments challenging to justify financially.

Local water district and state agency investments, private capital markets, performance-based contracting, and other alternatives offer help to close the Federal funding, delivery, and maintenance gaps, and meet some of our national water infrastructure needs in partnership with Federal agencies. Such partnerships have the potential to reduce overall project development costs and risks associated with such capital investments, expedite project delivery and associated water resource benefits, improve efficiencies and cost effectiveness, and maximize the respective strengths of the public and private sectors. Opportunities exist to leverage Federal and non-Federal funding through grants, loans and credit enhancements, as well as provide greater access to private sources of financing.

One challenge is that Federal agencies often lack legislative authority to dedicate a sustained revenue stream to assure non-Federal investors are fairly compensated for the costs and risks of constructing or maintaining Federal water projects, sometimes requiring approval through an act of Congress to proceed. The Council

supports a method of congressional budget scoring that considers the unique timing of the costs and benefits of water infrastructure investments, and accounts for long-term public health and safety, economic and environmental benefits, with fair and appropriate discounting.

There is no one-size-fits-all program, but several Federal financial and technical assistance programs, grants, loans, cost-share programs, and Federal-state-local or public-private partnerships have proven beneficial to the timely completion and ongoing maintenance of infrastructure projects at all scales.

The Congress and the Administration should work together to ensure adequate, stable, and continuing Federal appropriations for constructing, maintaining, and replacing critical Federal water projects and to assist states and local governments as they address their water infrastructure needs. Further, they should work together and with the states to streamline permitting processes and coordinate environmental and other regulatory reviews to eliminate duplicative procedures, reduce costs of compliance and construction, and ensure timely completion, maintenance, or relicensing of authorized infrastructure projects so vital to the West and the Nation.

Moreover, the Council supports the creation and maintenance of dedicated water infrastructure funding through special accounts with dedicated receipts to be promptly appropriated for authorized purposes following their deposit, as well as a variety of grant, loan, credit enhancement and other financial incentive programs to help meet diverse needs at all scales.

RURAL WATER PROJECTS

The Council strongly supports congressional action to expedite construction of authorized rural water supply projects in a timely manner, including projects that meet tribal trust and other Federal responsibilities—recognizing and continuing to defer to the primacy of western water laws and tribal settlements in allocating water among users. (WSWC Position #423, August 3, 2018)

Across the West, rural and tribal communities are experiencing water supply shortages due to drought, declining streamflows and groundwater supplies, and inadequate infrastructure, with some communities hauling water over substantial distances to satisfy their potable water needs. Often water supplies that are available to these communities are of poor quality and may be impaired by naturally occurring and man-made contaminants, including arsenic and carcinogens, which impact communities' health and their ability to comply with increasingly stringent Federal water quality and drinking water mandates. At the same time, many rural and tribal communities in the West are suffering from significant levels of unemployment and simply lack the financial capacity and expertise to finance and construct needed drinking water system improvements.

In 2014, the Bureau of Reclamation working with other Federal agencies and the Western States Water Council sought to identify and evaluate rural water needs and the demand for new rural water supply projects. Reclamation estimated the costs for rural potable water supply system improvements in the 17 western states to be in the range of $5 billion to $9 billion for non-Indian projects and approximately $1.5 billion for specific Indian water supply projects. Reclamation also estimated that the cost to complete currently authorized projects that are under construction rose from the $2 billion originally authorized to $2.4 billion (in 2014) and costs continue rising. Given past levels of funding these priority projects will not likely be completed until well after 2065 at a cost of more than $4.8 billion.

Reclamation has not requested funds for grants to undertake additional appraisal investigations or feasibility studies for new rural water projects, given the significant backlog of authorized projects and lack of Federal funding. Federal expenditures for rural water projects generate significant returns on the investment through increased national and local economic benefits, as well as improvements in quality of life. However, project benefits cannot be fully realized until the projects are completed.

RECLAMATION FUND SPENDING

The Council has a long-standing policy in support of fully appropriating receipts accruing to the Reclamation Fund for authorized projects, including rural and tribal water supply projects, as well as supporting an investigation of converting it to a true revolving trust fund. (WSWC Position #408, June 29, 2017)

Under the Reclamation Act of 1902, the Reclamation Fund was envisioned as the principle means for financing Federal western water and power projects with revenues from western resources—but these receipts are only available for expenditure pursuant to annual appropriation acts. Receipts are largely derived from water and

power sales, project repayments, and receipts from public land sales and leases, as well as oil and mineral-leasing and related royalties, almost exclusively from western lands, many adjacent to rural and tribal communities. With growing receipts—in part due to energy development across the rural West—and declining Federal appropriations for Reclamation Act purposes, the unobligated balance grows larger and larger (and is expected to soon exceed $16 billion), while the money is actually spent elsewhere, for other Federal purposes, contrary to the Congress' original intent.

The Council is committed to continuing to work cooperatively with the Congress, the Department of the Interior and Bureau of Reclamation to meet our present rural water needs in the West for present and future generations, within the framework of state water law. The Council recommends that the Congress and the Administration investigate the advantages of converting the Reclamation Fund from a special account to a true revolving trust fund with annual receipts to be appropriated for authorized purposes in the year following their deposit (similar to some other Federal authorities and trust accounts).

TRIBAL WATER RIGHTS SETTLEMENTS

The Council has consistently supported negotiated settlement of disputed tribal water claims, as well as steps to ensure that settlements, once enacted, will be funded. Unresolved tribal claims leave tribal and non-tribal water supply reliability uncertain. (WSWC Position #412, October 20, 2017)

The settlement of Native American water right claims is one of the most important aspects of the United States' trust obligation and is of vital importance to the country as a whole and not just individual tribes or states. The public interest and sound public policy require the resolution of tribal water rights claims in a manner that is equitable and least disruptive to existing uses of water. Negotiated quantification of tribal water rights claims is a highly desirable process which can achieve quantifications fairly, efficiently, and with the least cost. The advantages of negotiated settlements include: (1) the ability to be flexible and to tailor solutions to the unique circumstances of each situation; (2) the ability to promote conservation and sound water management practices; and (3) the ability to establish a foundation for cooperative partnerships between Native American and non-tribal communities.

The successful resolution of certain claims may require physical solutions, such as development of Federal water projects and improved water delivery and application techniques that provide tribes with "wet water." The United States has developed many major water projects that compete for use of waters claimed by Native American and non-tribal communities and has a responsibility to assist in resolving such conflicts. Tribal water rights settlements involve a waiver of tribal water right claims and tribal breach of trust claims that otherwise could result in court-ordered judgments against the United States and increase costs for Federal taxpayers. The obligation to fund resulting settlements is analogous to, and no less serious than, the obligation of the United States to pay judgments rendered against it.

Current Federal budgetary pressures and legislative policies make it difficult for the Administration, the states and the tribes to negotiate settlements knowing that they may not be funded because either they are considered earmarks or because funding must be offset by a corresponding reduction in some other expenditure, such as another tribal or essential Interior Department program. Tribal water rights settlements are not and should not be defined as congressional earmarks.

Steps should be taken to ensure that any water settlement, once authorized by the Congress and approved by the President, will be funded. Congress should expand opportunities to provide funding for the Bureau of Reclamation to undertake project construction related to settlements from revenues accruing to the Reclamation Fund, recognizing the existence of other legitimate needs that may be financed by these reserves.

ENERGY & WATER PLANNING

The Council supports integrating water and energy program and project planning, including promoting conservation and use efficiency, while seeking to minimize economic, environmental and other costs. (WSWC Position #420, March 16, 2018)

The West enjoys diverse and abundant energy resources, including renewable and non-renewable resources, and the West is a leader in the planning, development, diversification, management and protection of the Nation's water and energy resources. Maintaining adequate and sustainable supplies of clean water and energy present interrelated challenges. Water is scarce in much of the region and may or may not always be sufficient for all proposed uses. Power plant cooling and other

energy development related water requirements can be significant on state, local and westwide scales.

An integrated approach to water and energy resource planning, development, diversification, management and protection is necessary to achieve a thriving and sustainable future for the West. Effectively planning for the future requires gathering and integrating data and information on past, present and future water and energy supplies and demands, including demands by different sectors, uses and users. In general, current water use data (especially consumptive water use data) are not sufficient for detailed and comprehensive analyses to support many water/energy decisions and policy makers' needs. The Council has worked collaboratively with state and Federal agencies to develop a better understanding of water and energy supplies and demands.

Public-private partnerships are increasingly important in addressing our future water and energy challenges; and there is a continuing need for Federal and state water and energy resource agencies, public utility commissions, and other planners, regulators and policy makers to better define and consider the nexus between water and energy resources in their respective areas of jurisdiction. Continuing water and energy nexus research and development is needed to further our understanding and evaluate the effectiveness of different policies and programs given various future scenarios.

HYDROPOWER

The Council supports Federal legislative and administrative actions to authorize and implement reasonable hydropower projects and programs that enhance our electric generation capacity and promote economic development, through streamlined permitting processes, while appropriately protecting environmental resources. The future development of potential hydropower resources should be appropriately undertaken in compliance with substantive and procedural state water law and interstate compacts, and consistent with the states' authority under Clean Water Act Section 401. Further, all rights and preference privileges of existing water and power users should be respected. (WSWC Position #391, March 22, 2016)

The hydropower resources of the West have been developed through partnerships between energy and water users and continue to be inextricably connected. Clean, efficient, inexpensive hydropower is a vital part of the energy resources needed to meet our present and future energy demands. Hydropower is a prominent component of electricity generation in a number of western states, and important part of state renewable portfolio standards. Hydropower is the largest source of renewable electricity in the United States, representing about 48 percent of total renewable electricity generation, with approximately 101 gigawatts (GW) of capacity and nearly 7 percent of total electricity generation. (www.energy.gov/sites/prod/files/2016/10/f33/Hydropower-Vision-Chapter-2-10212016.pdf—p. 76)

The potential exists for further public and private hydropower development by upgrading existing generators, developing small hydro and the power potential from existing man-made conduits and canals, as well as hydroelectric pumped storage projects. Such development can often be undertaken with little impact on the environmental and important ecological resources, requiring minimal further environmental review. Permitting requirements may be appropriately minimized and streamlined so as to promote reasonable development while avoiding unnecessary costs.

Thank you for the opportunity to testify.

QUESTION SUBMITTED FOR THE RECORD BY REP. CUNNINGHAM TO TONY WILLARDSON, EXECUTIVE DIRECTOR OF THE WESTERN STATES WATER COUNCIL

Question 1. This is an issue that is particularly relevant to the folks of South Carolina's 1st District. Down in my district you've got the Ashley River and the Cooper River coming together to form the Charleston Harbor before discharging into the Atlantic Ocean. My district is among the East Coast's most vulnerable areas when it comes to rising sea levels. The lack of infrastructure and drainage systems to handle the uncompromising sea level rise often puts our community under water. It also leads to habitat loss, seawater encroachment, flooding, and a loss of water quality. Scientists expect climate change to increase the frequency of very heavy precipitation events. In my home state of South Carolina, they say that "When it rains, it floods in Charleston." A recent study showed that Charleston is one of the most at-risk cities in the United States, and they predict that Charleston could be

underwater in 80 years. This is a very important issue that doesn't just affect Colorado or the western United States, it affects all of us.

What emerging technologies and management approaches can communities implement that will help them manage increasingly unpredictable precipitation and flood conditions?

Answer. Thank you for the question Rep. Cunningham.

Each individual state is unique, and South Carolina faces its own particular challenges. While as a region, the West is generally more concerned with scarcity, drought and water supply availability, we are also vulnerable to flooding and other unpredictable climate extremes. Sea level rise and its impact on coastal communities is obviously an issue for our West Coast states, and Texas on the Gulf of Mexico. In order to improve our resiliency to climate variations, there are both short- and long-term actions that the Council supports focused on an integrate, collaborative and grassroots approach that will require stronger collaboration and cooperation that transcends political and geographic boundaries between states, Federal agencies, tribes, and local communities.

First, we need to invest more to maintain, restore, modernize and upgrade water, weather and climate observation networks. We need to be able to better define the problems, which requires placing a high priority on funding vital water data monitoring and visualization programs, and related geospatial applications for climate adaptation planning. Critical Federal on-the-ground and remote sensing programs include the U.S. Geological Survey's Streamflow Information Program and the National Land Imaging Program (and Landsat). The National Oceanic and Atmospheric Administration (NOAA) uses Light Detection and Ranging (LiDAR), often from aircraft, to gather topographical data supporting activities such as inundation and storm surge modeling, hydrodynamic modeling, sediment transport modeling, shoreline and habitat mapping, emergency response, hydrographic surveying and coastal vulnerability analysis. NOAA has also developed and is refining its National Water Model, which is primarily designed to predict flooding. Better data and science will lead to better decisions, and hopefully allow public and private decision makers to take more informed actions to avoid and/or mitigate adverse consequences.

Second, the Council supports state and Federal applied research programs that would assist water and emergency management agencies at all levels of government in adapting to climate variability and making sound scientific decisions. More informed decision making depends on our ability to understand, monitor, predict, and adapt to climate variability. The West and the Nation experience great subseasonal, seasonal and annual precipitation variability. Decision makers need more skilled dynamical and probabilistic modeling to better understand hydroclimate processes and improve forecasts of rainfall and runoff. This involves a greater investment in atmospheric and other sciences, as well as high-capacity computing resources for timely and multiple runs of very complex models.

Third, the West and the Nation depend on an intricate and aging water infrastructure system. Greater investment is needed to maintain its reliability and our ability to store, manage, conserve, control, protect and treat our water supplies. As our ability to predict precipitation events improves, particularly extreme events, opportunities will become apparent to implement forecast informed reservoir operations (FIRO) with more confidence to more efficiently operate projects and time reservoir releases to maximize storage for both water supply and flood protection.

Many water projects have exceeded their design life, and others have deteriorated due to underfunded and deferred maintenance, repair and replacement. Inadequate, inconsistent, and untimely Federal funding increases construction, maintenance and financing costs. Often the lack of a dedicated revenue stream raises costs. Moreover, Federal budget scoring assesses the full cost of investments upfront, while disproportionately discounting long-term benefits.

Existing Federal, state and local programs to publicly finance water infrastructure are crucial, but insufficient. The Federal Government will continue to play a significant role in cost sharing and financing projects with national benefits. Further, opportunities also exist to leverage Federal, non-Federal and private capital through grants, loans and credit enhancements.

Long-term difficult decisions and expensive investments may be necessary to adapt to climate variability and extreme events related to sea level rise. Speaking from personal experience, my home state of Utah is obviously not susceptible to sea level rise, but much of our population is located along the Wasatch Front, adjacent to the Great Salt Lake. A terminal lake, its levels have dropped to the point that it isn't so great—as a result of multiple years of drought! However, in the 1980s the lake rose unrelentingly due to unusually wet weather patterns. I remember

volunteering to fill sand bags on a Sunday night at midnight, and for days water ran in a makeshift channel through downtown Salt Lake City. That year there was also significant damage to the spillway outlets at the Federal Glen Canyon Dam as Upper Basin flows on the Colorado River peaked.

In response to the flooding and rising lake levels, communities around the lake seriously considered the need to dike around their sewage treatment plants. Salt Lake City improved its storm drain system. The state of Utah with Federal funding raised I–80 near the lake, not once, but twice. The state also built a pumping plant to move lake water into our West Desert to evaporate. The Corps of Engineers completed a long-delayed flood control reservoir above the city, Mountain Dell. The Bureau of Reclamation redesigned and rebuilt the outlets at Glen Canyon. Similar measures are likely to be needed across the country as we adapt to changing climate conditions and increasing variability.

Mr. HUFFMAN. Thank you, Mr. Willardson. Next we recognize Mr. Bill Diedrich, who will be testifying on behalf of the Family Farm Alliance.

Thank you for being here, Mr. Diedrich. The Chair recognizes you for 5 minutes.

STATEMENT OF BILL DIEDRICH, FAMILY FARM ALLIANCE, LOS BANOS, CALIFORNIA

Mr. DIEDRICH. Good morning, Chairman Huffman, Ranking Member McClintock, and members of the Subcommittee. My name is Bill Diedrich. On behalf of the Family Farm Alliance, I thank you for this opportunity to present this testimony on reliability of water supplies in the western United States.

I am a fourth-generation California farmer, and I cherish the role that sustainable, irrigated agriculture plays in producing safe and affordable food supply. Those of us who understand say we have dirt in our veins. My written testimony illustrates the problems the western farmers and ranchers face, in terms of water supply reliability. The testimony outlines what producers like me and others across the West are doing to address these challenges, and it provides policy recommendations that we believe lay the foundation for more effectively addressing water supply reliability in the western United States.

The most helpful thing that Congress can do for states suffering from unreliable water supply is to urge creativity, innovation, and flexibility on the part of Federal water management and regulatory agencies.

My state of California is still recovering from the 2012–2016 drought, the worst drought in its recorded history. Record dry conditions, coupled with water supply reductions related to regulatory actions and aging water infrastructure, resulted in water supply reductions or constraints for all beneficial uses of water in California.

During the height of recent drought, for 3 years in a row, many agricultural water users effectively received no allocations at all from the Federal Central Valley Project, one of the largest irrigation water projects in the world. These challenges continue, despite recent and continued precipitation. As of last week, nearly every reservoir in California is at or over its historical average for this time of year. Still, CVP farmers south of the delta were given an initial allocation of only 35 percent of their contract amounts.

What this means is that California has plentiful snow, plentiful rain, and nearly adequate reservoir levels. Yet, at this time the San Joaquin Valley CVP Ag. water service contractor irrigators are likely to receive less than half of their contracted water supplies when the final allocations are made. These initial allocation numbers are critical to making crop planting decisions.

California's groundwater resources are an overdraft, and the drought has made this worse. The Sustainable Groundwater Management Act passed by the state of California in 2014 will become fully implemented and begin the process of eliminating this overdraft by 2040.

There are only two ways to achieve this: increase supply or reduce demand. This will magnify the surface water shortfall and jeopardize the safe and affordable food supply produced in the Central Valley of California. This groundwater depletion has occurred in the San Joaquin Valley, predominantly as a result of reduction in reliability of surface water supplies.

The recent and current water crisis in California provides a real-world sense of the types of challenges western irrigators face in times of reduced water supply reliability. These include competition for scarce water supplies, insufficient water infrastructure, growing populations, endangered species, and increased climate variability.

Water management in the West is becoming increasingly complex and inflexible. Water managed for environment is not held to an equal standard of accountability as other beneficial uses. The Federal Endangered Species Act needs to be implemented in a multi-faceted way across agencies to better benefit species, the environment, and rural communities. Considering increased climate variability and competing needs, it is obvious the western water storage capacity is insufficient.

Given these challenges, in order to secure future water supply reliability, we must depend on collaborative, science-based water management decisions; increase our investments in water infrastructure; and diversify our water portfolio, including water recycling, conservation, reservoir optimization, and weather forecasting technologies. What works for one region doesn't work for all.

Thank you, and I would stand for any questions members of the Subcommittee have. Thank you.

[The prepared statement of Mr. Diedrich follows:]

PREPARED STATEMENT OF WILLIAM DIEDRICH, REPRESENTING THE FAMILY FARM ALLIANCE

Good morning Chairman Huffman, Ranking Member McClintock, and members of the Subcommittee. My name is William Diedrich, and on behalf of the Family Farm Alliance (Alliance), I thank you for this opportunity to present this testimony on a matter of critical importance to our membership: the reliability of water supplies in the western United States. The Alliance is a grassroots organization of family farmers, ranchers, irrigation districts, and allied industries in 16 western states. The Alliance is focused on one mission: To ensure the availability of reliable, affordable irrigation water supplies to western farmers and ranchers. We are also committed to the fundamental proposition that western irrigated agriculture must be preserved and protected for a host of economic, sociological, environmental, and national security reasons—many of which are often overlooked in the context of other national policy decisions.

The Family Farm Alliance has a long history of collaboration with partners in all levels of government, conservation and energy organizations, and Native American tribal interests who seek real solutions to water resources challenges in the West.

We seek to advocate for a proper role for the Federal Government on water matters, a vision that focuses on research and development; full integration, coordination and maximum sustainable use of resources; and planning that is driven from the "ground up." The Alliance also has a well-established relationship with Congress, with 70 invitations to testify before congressional committees on Western agriculture, water and environmental matters in the past decade.

This testimony will illustrate the problems Western farmers and ranchers face in terms of water supply reliability, outline what producers like me and other Westerners are doing to address these challenges, and provide policy recommendations that we believe lay the foundation for effectively addressing water supply reliability in the western United States.

PERSONAL BACKGROUND

I am a fourth-generation California Central Valley farmer and I appreciate the role of a sustainable irrigated agriculture industry. I have also been very involved in water issues and see the importance of reliable water for the many important needs that exist. At my core, I am a Californian and an American, and I believe the health of our communities, our ecosystems and our farmers and ranchers are directly related to our prosperity as a state and a Nation. Water shortages affect all sectors of the Western economy, creating problems for cities and towns, manufacturers, builders, service providers, and individual citizens that are just as challenging as the difficulties faced by farmers and ranchers. The environment, too, is stressed by water shortages. In many areas of the West, we see fish and wildlife, plentiful or endangered, struggling to adapt and survive in extremely harsh conditions during times of drought.

Water connects us all—farms, cities and the environment—and while decreased water supply reliability presents unique problems for each sector, our solutions should be interconnected and mutually beneficial—not divisive. That requires a willingness of all parties, including Federal agencies, to be creative and flexible. That is happening in some places. In other places, it's not. The most helpful thing that Congress can do for states suffering from a lack of water supply reliability is to encourage, demand, and even mandate, where necessary, creativity, innovation and flexibility on the part of Federal water management and regulatory agencies.

The Family Farm Alliance is an organization made up of farmers and ranchers in the West, but the water shortage problems we all face vary by region, topography, climate, soil conditions, hydrology, and crop. These problems have some elements in common, including inadequate or deteriorating water storage infrastructure, inflexible or outdated operational requirements and regulatory conditions, and government agencies that are not nimble enough, or not motivated, to seek out and embrace better ways of doing things to ensure the most benefit for the broadest suite of public interests. Solutions also vary by state or by region, but they, too, are characterized by certain common elements, including creativity, flexibility and balance. I will discuss water supply reliability issues in a few different areas of the West, as well as some examples of successful solutions and potential solutions. Since I'm from California, I'll begin there.

RECOVERING FROM THE 2012–2016 CALIFORNIA DROUGHT

California is still recovering from the 2012–2016 drought, the worst drought in its recorded history. Record dry conditions, coupled with water supply reductions related to regulatory actions and aging water storage and conveyance infrastructure, resulted in water supply reductions or constraints for most sectors in California. In 2014, vast areas of farm land in the San Joaquin and Sacramento Valleys received no surface water at all—a 100 percent reduction. Those same areas were again zeroed out in 2015. Overall, agricultural water supplies in the Central Valley have had their reliability reduced by 65 percent since 1992. During the drought, nearly 75 percent of the state's irrigated farm land (7 million acres), received 20 percent or less of its normal surface water supply and according to the California Department of Water Resources (DWR), nearly 692,000 acres of farmland were fallowed in 2014 as a result of water shortages.

During the height of the recent drought, for 2 years in a row, many agricultural water users received no allocations at all from the Federal Central Valley Project (CVP), one of the largest water projects in the world. Table 1 shows the CVP allocations from 2014–2016. In both 2014 and 2015 no surface water supplies were allocated to water users on the Tehama-Colusa Canal, and in the San Luis Unit and Friant Division of the CVP. Settlement contractors, primarily agricultural water users, have water rights that pre-date the Federal project, making them priority

rights on the system, yet even allocations to those senior water rights holders were reduced during the drought.

Table 1. Central Valley Project Water Allocations (2014, 2015 & 2016)

Contractors	*Percent Supply*		
	05/13/14	*02/27/15*	*07/18/16*
North of Delta			
Agricultural Contractors (Ag)	*0%*	*0%*	*100%*
Urban Contractors (M&I)	*50%*	*25%*	*100%*
Wildlife Refuges	*75%*	*75%*	*100%*
Settlement Contractors / Senior Water Rights	*75%*	*75%*	*100%*
American River M&I Contractors	*50%*	*25%*	*100%*
In Delta-Contra Costa	*50%*	*25%*	*100%*
South of Delta			
Agricultural Contractors (Ag)	*0%*	*0%*	*5%*
Urban Contractors (M&I)	*50%*	*25%*	*55%*
Wildlife Refuges	*65%*	*75%*	*100%*
Settlement Contractors / Senior Water Rights	*65%*	*75%*	*100%*
Eastside Division Contractors	*55%*	*0%*	*0%*
Friant – Class 1	*0%*	*0%*	*75%*
Friant – Class 2	*0%*	*0%*	*0%*

Source: Bureau of Reclamation 2019

Almost as large as the Federal CVP, California's State Water Project (SWP) cut agricultural deliveries by 80 percent in 2015.

In most areas where surface water supplies were severely reduced or eliminated, farmers turned to groundwater to maintain their permanent crops—grapes, tree fruits, nuts, citrus—that represent a lifetime's investment. But groundwater supplies are not infinite and were severely depleted during the drought in areas that received no surface water. Groundwater also isn't cheap. Wells cost upwards of $200,000 each and they are expensive to run, so many farmers pump only enough water to keep their trees alive, but not producing. Often, farmers tear out mature, productive trees and vines and replace them with saplings that won't produce a crop for years, but require far less water to keep alive in challenging conditions. And in some places like the citrus belt in the Friant Division of the CVP, there is no groundwater at all. The many small farms there, which produce most of the Nation's oranges, had their surface water cut off for the first time in 60 years in 2014 and 2015.

Many of my neighbors in 2014 and 2015 were forced to abandon or fallow portions of their farms. When one hears that land is "fallowed" it might only seem that the impact is to the farmer, but that is definitely not the case. Every acre of farmed land generates jobs, economic activity and products. That is why the reduction in the water supply reliability of the CVP is so devastating to the rural agricultural communities of the Central Valley.

For every acre fallowed, workers have less work and tractors are used less. If I use my tractor less, I buy less fuel, lubricants and parts and tires, which means the local businesses that supply these things sell less and their companies suffer. When I don't purchase inputs for the land (fertilizer, seeds, amendments, etc.), the local companies that sell these items suffer reduced sales and the truck drivers who deliver these items have less work. With fewer trucks running fewer routes, fuel and parts purchases are reduced. If that one fallowed acre was intended to be a tomato field, those tomatoes would not be trucked to market or the processing plant.

As you can see, there is a direct interconnection between agriculture and many other industries. Press reports will acknowledge that California agriculture is a $50 billion industry, but then attempt to minimize this impact by suggesting that it is "only" 2 percent of the GDP of the state. The oft-reported $50 billion number is only the farm gate value of the products. It does not include all the other industries that benefit from the trucking and processing of the agricultural products (and all the fuel, parts, etc., from the activities). Clearly, agriculture is a huge economic driver for my state, particularly in rural communities. A report by the University of

California shows that the food and beverage industry contributed $82 billion and 760,000 jobs that are directly and indirectly linked to agricultural products.[1]

This is a very concerning time for me, my family, and my neighbors, since substantial investments are being made, primarily with the intent of converting more of our operation to drip irrigation, which we hope will stretch limited water supplies. This conversion creates an electrical demand as we move from gravity irrigation to pressurized subsurface irrigation. My friend Cannon Michael, who serves on the Family Farm Alliance board of directors, recently installed 1 megawatt of solar panels to offset the impact of the power cost needed to support his drip irrigation conversion. Those investments will be for naught if the current lack of reliability for surface water deliveries persists into the future and there is no water to conserve or use for groundwater recharge.

My fellow California farmers are doing their best to offset the devastating loss of water. For example, producers have been forced to buy water, when available, from other sources. In certain instances, farmers had no choice but to buy water at a rate more than 25 times what they normally would pay. In the absence of once reliable surface water supplies, California farmers have looked to groundwater, where available, which is not sustainable. Central Valley producers have been trying to get ahead of a much feared, but anticipated, drought for years. Notably, they've spent about $3 billion to install more efficient irrigation systems on almost 2.5 million acres from 2003 to 2013, according to information compiled by the California Farm Water Coalition. These investments will continue as farmers strive to stretch and most efficiently manage their water supply.

CALIFORNIA DROUGHT: MYTH VS. REALITY

Here are some facts that are often overlooked in media coverage of the recent California drought:

- California agriculture grows more than 50 percent of America's fresh fruits, nuts and vegetables across 78,000 farms, 400 crops and 450,000 jobs. California's value of agricultural output was $50 billion in 2017.[2]
- California is the country's largest agricultural producer and exporter. Agricultural products were one of California's top 5 exports in 2017, totaling $20.6 billion, over 14.6 percent of total U.S. agricultural exports.[3]
- Crop production per acre-foot of water rose 43 percent in California between 1967 and 2010.[4]

Some media accounts continue to advance the decades-old myth that farmers consume 80 percent of water supplies in California and other parts of the West. But if we look at the "water footprint" in the same way as we have come to talk about the "carbon footprint," we get a different picture, particularly in California. Numbers from the California DWR provide perspective. According to the Department, statewide water use breaks down as follows: 10 percent urban use; 41 percent agricultural use and 49 percent use for environmental management: wetlands, Delta outflow, wild and scenic designations, and instream flow requirements.

We should also recognize that farms transform water into products that are needed to sustain the lives of our entire population. We are all part of "agricultural water use" every day—multiple times per day.

Others in the media suggested that the shift toward higher value crops like nuts and wine grapes have led to an increase in agricultural water use. During the 2014–2015 drought years, almonds were the preferred target of these reports. But according to California DWR, the total amount of agricultural water use has held steady since 2000 and has actually declined over the longer term.

THE CALIFORNIA WATER RELIABILITY CRISIS

California has an incredibly diverse and variable climate, with precipitation and snowpack totals varying widely from year to year, with runoff totals ranging from a high of 52,830,000 acre-feet in 1983 to the lowest recorded runoff of 6,170,000 acre-feet in the driest individual year of 1977. While California has natural variability in precipitation and snowpack, water allocations to CVP contractors have been

[1] http://giannini.ucop.edu/media/are-update/files/articles/V18N4_3.pdf.

[2] California Department of Food and Agriculture, Gianninni Foundation of Agricultural Economics—University of California, USDA, Assembly Committee on Jobs, Economic Development and the Economy.

[3] California Department of Food and Agriculture, California Agricultural Statistical Review, 2017–2018.

[4] USDA National Agricultural Statistics Service, California Department of Water Resources.

disconnected from water year types, predominantly resulting from increased requirements for environmental water deliveries. This year is a good example of the increasing disconnect between the amount of actual water that California receives each year and the ability of the Bureau of Reclamation (Reclamation) to operate the CVP and allocate water to its contractors in a fashion that reflects the actual hydrology.

As of February 22, 2019, nearly every reservoir in California is at or over its historical average for this time of year, snow water content is 115 percent of the April 1 peak, and precipitation is 120 percent of average, but just last week, south of Delta CVP agricultural service contractors received an initial allocation of only 35 percent of their contract amounts. What this means is that California has plentiful snow, plentiful rain, and nearly full reservoirs, yet San Joaquin Valley irrigators are likely to receive less than 50 percent of their contracted water supplies when the final allocations are made. In order to make decisions about planting crops, a farmer must consider the water available to grow the crop. Thus, the initial allocation numbers are critical. Even if the allocation increases in future months, it will be past the time when a farmer must make their decision to plant.

Future Projections

The Sacramento and San Joaquin Rivers Basin Study released by Reclamation indicates that throughout the 21st century, temperatures are projected to increase, snowpack will likely decline and snowpack elevation levels will rise, precipitation will increase during fall and winter months, and spring runoff will decrease. These factors will exacerbate the existing imbalance between the demands in these river basins and the ability to deliver reliable water supplies to communities and ecosystems that rely on them. The result of these changes, coupled with expected population growth and changes in land use, is an average annual unmet water demand for CVP contractors that is expected to range between 2.7 million and 8.2 million acre-feet per year, with most of the unmet demands occurring south of the Bay-Delta.[5]

Groundwater

Groundwater is a critically important part of California's water supply, accounting for 40 percent of total annual agricultural and urban water uses statewide in an average year, and up to 65 percent or more in drought years. About three-quarters of the state's residents—around 30 million people—depend on groundwater for at least a portion of their water supply; for 6 million residents, it is their only supply.

California DWR estimates that on average, 2,000,000 acre-feet is withdrawn from the state's aquifers per year more than what is being recharged, and much more so during periods of drought. This is nothing new; scientists estimate that since California's development in the late 1800s, the state's groundwater reserves have been reduced by 125,000,000 acre-feet, or 4.5 times the capacity of Lake Mead. Most of this groundwater depletion has occurred in the San Joaquin Valley, predominantly as a result of a reduction in the reliability of surface water supplies.

KEY CHALLENGES FACING WESTERN IRRIGATORS

The key challenges Western irrigators face in times of reduced water supply reliability include competition for scarce water supplies, insufficient water infrastructure, growing populations, endangered species and increasing weather variability/climate change. Across the West, several key water policy challenges stand out:

Water management in the West is becoming increasingly complex and inflexible

We need a new way of looking at how we manage our limited water resources, one that includes a broader view of how water is used, along with consideration of population growth, food production and habitat needs. The goal should be to integrate food production and conservation practices into water management decision making and water use priorities, creating a more holistic view of water management for multiple uses. We must begin to plan now in order to hold intact current options. Planning must allow for flexibility and consider all needs, not just focus on meeting future needs from population growth.

In many parts of the West, litigation stemming from citizen suit provisions of environmental laws including the ESA and Clean Water Act (CWA) is producing Federal court decisions (or court approved "settlements") that direct Federal agency "management" of state water resources. Congress should recognize that this type of litigation and resulting settlements can actually harm the overall health and

[5] https://www.doi.gov/sites/doi.gov/files/uploads/sec_order_no._3343_cal_water_0.pdf.

resilience of landscapes and watersheds by focusing on single species management under the ESA. We should seek solutions that reflect a philosophy that the best decisions on water issues take place at the state and local level. Finding ways to incentivize landowners to make the ESA work is far more preferable than the ESA being used as a means of "protecting" a single species (such as the Sacramento-San Joaquin River Delta smelt in California, or the spotted frog, in Oregon) without regard for other impacts, including those on other non-listed or state-listed species.

Droughts occur routinely in the West; that is why Reclamation made such important investments in water supply infrastructure over the past century. However, this infrastructure was never designed to meet the burgeoning demands of growing populations and environmental needs in the West, while continuing to support farmers, ranchers and rural communities during periodic droughts. Unfortunately, future droughts in the West are predicted to be deeper and longer than we have historically experienced in the 20th century. We believe Congress should provide Federal agencies with more flexibility under environmental laws and water management regulations to respond to drought conditions when they arise. And where such flexibility currently exists, Congress should demand that agencies use it promptly and with a minimum of bureaucratic delay.

As one example of where innovation, flexibility and creativity are needed, the U.S. Army Corps of Engineers (Corps) operates dozens of water projects throughout the West, and it regulates the operations of many non-Federal dam and reservoir projects according to criteria that in many cases were established decades ago and have not been updated to reflect changed conditions or new technology. As a result, projects are sometimes forced to waste large amounts of water in order to adhere to the letter of a flood-control plan that no longer has a basis in reality. The Corps now has existing authority to make short-term adjustments to operation criteria during droughts, but the agency rarely does so on a proactive basis.

Environmental water management should be held to an equal standard of accountability as other beneficial uses

We must manage water to meet all needs but in a manner that "shares the pain," not creates winners and losers, especially when the losers are mostly the very beneficiaries—farmers and rural communities—the Federal water projects were originally built to serve. The past Federal management of water flows in California's Bay-Delta, which has redirected millions of acre feet of water away from human uses and toward the environment, with little, if any, documented benefit to the ESA-listed fish intended for protection, is a prime example.

Good water management requires flexibility, as well as adaptive management. More regulation usually reduces this flexibility to balance competing demands and find a way forward that works for all stakeholders. Federal agencies managing the competing demands for water in the West have in some cases failed in creating opportunities for more flexible water management during times of crisis, and rarely measure their actual results (good or bad) from their water supply decisions.

The ESA needs to be implemented in a new way to better benefit species and rural communities

The original intent of the ESA—stated in the Act itself—was to encourage "the states and other interested parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs which meet national and international standards." Of special importance to the Family Farm Alliance is that the ESA explicitly declared that it was the policy of Congress that "Federal agencies shall cooperate with state and local agencies to resolve water resource issues in concert with conservation of endangered species."

The authors of the ESA clearly believed in applying the ESA in a way that would foster collaboration and efficiency of program delivery, in an incentive-driven manner. Unfortunately, implementation of the ESA has developed into an approach that is driven by litigation and conflict rather than collaboration. As far as the Act itself is concerned, little to no progress has occurred to keep this 40-year-old law in step with the challenges facing declining species in an era of climate change. The ESA has not been substantially updated since 1988.

At the heart of the Family Farm Alliance's concerns with the ESA is the ever-present potential of serious Federal restrictions being placed on the West's irrigation water storage and delivery activities, often using federally developed water infrastructure in protecting listed species. Future endangered species listings are on the horizon. That prospect has the Alliance very concerned about potential new Federal restrictions being placed on the water supplies that are crucial to the West's $172-billion per year irrigated agricultural economy.

The ESA, while well intentioned, is a law that is not working as it was originally intended. It needs to be more about incentives and collaboration and less about litigation and regulation. Fewer than 2 percent of the species ever listed under the Act have been recovered and removed from the list. Meanwhile, the negative economic and sociologic impacts of the ESA have been dramatic.

The Family Farm Alliance for decades has worked to develop specific, practical changes to the ESA that we think will make it work effectively today. Application of the ESA today must be viewed through the prism of other human needs, including food production. To that end, management of our natural resources should be geared toward an approach that views the entire landscape in a more holistic manner regarding its value for wildlife, food production, and other capacities. The flexibility built into the Act has the potential to yield net conservation benefits for imperiled species, as ESA practitioners have recognized.[6] While a regulatory approach may be necessary for species on the brink of extinction, such an approach should be employed sparingly, consistent with congressional intent and sound public policy.

Insufficient Storage and Aging Water Infrastructure Must be Addressed to Protect Future Water Supply Reliability

More surface and groundwater storage is a critical piece of the solution to future water shortfalls. Congress should streamline regulatory hurdles and work to facilitate the construction of new and expanded surface storage facilities, providing a more effective process to move water storage projects forward.

Also, new tools to assist in financing major improvements to aging water infrastructure will be needed in the coming years to ensure that farmers and ranchers who benefit from these upgrades can afford repayment terms. Water infrastructure is a long-term investment, as are farms and ranches, and longer repayment and lower interest terms will be crucial to reinvesting in these aging facilities to meet the challenges of tomorrow. Such improvements could include investments in everything from new and expanded water storage reservoirs (both on- and off-stream), regulating reservoirs, canal lining, computerized water management and delivery systems, real-time monitoring of ecosystem functions and river flows for both fish and people, and watershed-based integrated regional water management. With the creation of the Water Infrastructure Finance and Innovation Act (WIFIA) in the WRRDA 2014, the Alliance believes a similar affordable loan program could be instituted at Reclamation to assist in providing capital for such investments. Also, more flexibility may be needed to allow for private investments at Reclamation facilities in order to attract additional capital to meet future water supply needs.

Western irrigators need flexible, streamlined policies and new affordable financing tools that can provide balance and certainty to support collaborative efforts and manage future water infrastructure challenges. Solutions in all of these areas will be crucial to future successes in agricultural production, conservation and community outcomes in the West.

INNOVATIVE SOLUTIONS

For family farmers and ranchers, finding solutions to constantly emerging challenges is just business as usual. Nature, the markets and the government are always finding new problems to throw at farmers, and farmers who are not determined, resourceful and innovative will not succeed.

Irrigators and their local water agencies are responding to the challenges of reduced water supply reliability with determination, resourcefulness and innovation. They also are bringing those attributes to bear in planning for a future where "drought" may be a long-term or even permanent condition. Throughout the West, farmers, ranchers and irrigation agencies have undertaken creative measures to efficiently manage increasingly scarce water resources. Some of these actions were intended to address the immediate crisis of recent western droughts; others have been implemented as part of the broad portfolio of actions that successful farmers are employing to stay profitable in today's fierce economic and regulatory climate. If Federal agencies are willing to work collaboratively with farmers and ranchers, the result would likely be better management of water for both economic purposes and environmental uses.

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[6] P. Henson, R. White, and S.P. Thompson. 2018. *Improving Implementation of the Endangered Species Act: Finding Common Ground Through Common Sense*, BioScience (available at https://doi.org/10.1093/biosci/biy093).

The following are real-world examples that Congress and the Administration should consider when developing legislation and polices to address the current drought and water management for the future:

Collaboration, Ecosystem Restoration, and New Storage: Yakima Basin (Washington)

The Yakima River Basin in Washington State does not have enough surface water storage facilities, with over 2.4 million-acre feet of water needs annually dependent upon only 1 million acre-feet of surface water storage capacity. The Yakima Basin is experiencing increased pressures and demands on our 1 million acre-feet of reservoir storage capacity, while we are now at above average carryover water storage, current water storage capacity cannot make up for shortages in the snow pack. They desperately need increased water storage carrying capacity to meet dry-year demands like those we experienced in 2015, with pro-ratable (junior) water rights receiving only 47 percent of normal supplies—a dire situation for the significant number of permanent crops in the Basin.

To help plan for expanding access to more irrigation and M&I water storage capacity and to help relieve tensions in the Yakima Basin over water supply management for all needs, a large cross-section of the water stakeholder interests and the Yakama Nation have worked together over the past several years in developing the Yakima Basin Integrated Plan. The Integrated Plan is a well thought out, long-term comprehensive set of solutions to restore ecosystem functions and fish habitat and improve long-term reliability of water supplies for stream flows, agricultural irrigation and municipal supply. The Integrated Plan was developed in a public, collaborative process involving local, state, Federal and tribal governments plus stakeholders representing environmental, irrigation and business interests. The consensus achieved by this diverse group represents a major and unprecedented accomplishment for the Yakima Basin and for water management in the western United States. The Integrated Plan offers a means to avoid a tangle of litigation and hardship for these users in future years. The Yakima Basin Integrated Plan is believed to be the first basin-wide integrated plan in the United States to achieve this level of success.

Prior efforts to increase water storage in the Yakima Basin have failed, in part due to a lack of consensus among the key stakeholders. The Integrated Plan offers the best opportunity in decades to resolve long-standing problems afflicting the Basin's ecosystem and economy. In addition, improving water conservation and management, along with making available increased water storage for farms, fish and our communities are key components of the Plan. When implemented, the Plan will greatly improve operational flexibility to support instream flows while meeting the Basin's basic water supply needs under a wide range of seasonal and annual snowpack and runoff conditions, both now and under a wide range of estimated future hydrologic and climatic conditions.

Long-term Environmental Enhancement and Water Supply Reliability: Voluntary Settlement Agreements to update the Sacramento San Joaquin Bay-Delta Water Quality Control Plan (California)

The California State Water Resources Control Board (SWRCB) oversees water rights and water quality in California. The Board is in process of updating its Bay Delta Water Quality Control Plan, which identifies beneficial uses of the Bay-Delta, water quality objectives for the reasonable protection of those beneficial uses, and a program of implementation for achieving those objectives.

The U.S. Department of the Interior, the California Natural Resources Agency, and water rights holders throughout California are working on a separate but related effort to craft voluntary, stakeholder-based outcomes in the watersheds of the Sacramento River and major San Joaquin River tributaries. These voluntary settlement agreements (VSAs) are a comprehensive plan to improve water quality and habitat conditions with a manageable impact to water users and highlight the positive outcomes that can occur when agencies choose to collaborate with water users. Implementation of the VSAs will maintain the viability of native fishes in the Sacramento and San Joaquin River watersheds and the Delta ecosystem, while concurrently protecting and enhancing water supply reliability, consistent with the statutory requirement of providing reasonable protection for all beneficial uses.

The VSA's have a few key components: [7]

- Provide additional instream flows averaging between 740,000 and 1,040,000 acre-feet in a manner that does not conflict with groundwater management requirements under California law, doesn't reduce flows for wildlife refuges, and maintains reliability of water supply for other beneficial uses.
- Implementation of significant non-flow measures to address the many factors negatively impacting fish populations, including predation by non-native species, passage barriers, and hatchery productivity.
- The development of a comprehensive science and monitoring program, incorporating a structured decision-making process, to inform implementation of flow and non-flow measures.
- Dedicated funding for implementation of science and ecosystem and habitat improvement measures of approximately $770 million from a per acre-foot fee placed on water users.

It is the Alliance's position that locally negotiated, stakeholder driven solutions are far more durable than those driven through a regulatory process that leads to litigation. The Alliance would urge congressional support for Federal efforts to implement California's Voluntary Settlement Agreements.

Conservation and Drought Resilience: Colorado River Basin

In Wyoming, ranchers Pat and Sharon O'Toole have always managed their land with conservation in mind. Along the way, they've built strong partnerships with Trout Unlimited, Audubon Wyoming and The Nature Conservancy; organizations some ranchers once viewed as adversaries. Further south, in the fertile North Fork Valley outside of Paonia, Colorado, Harrison Topp took the leap from annual vegetable production to perennial fruit, growing food in a region with just 15 inches of annual average precipitation.

The Family Farm Alliance report, "*Innovations in Agricultural Stewardship: Stories of Conservation & Drought Resilience in the Arid West*," [8] focuses on these two case studies and three others that profile producers across the Colorado River Basin and beyond who—with curiosity, creativity and seasons of trial and error—are conserving resources while enhancing productivity. The Alliance teamed up with the National Young Farmers Coalition on this report with the aim of elevating the voices of farmers and ranchers who are employing smart solutions to build drought resilience, steward water and grow good food.

Some of the farmers highlighted in the Alliance report are integrating efficient irrigation technology with soil health to increase both productivity and water savings. Others are navigating conservation within constraints outside of their control, such as the operations of the ditches which deliver water to farms. To paint a fuller picture of the complexities and nuances of agricultural water conservation in the West, the Alliance worked with the engineering firm Applegate Group to create a water balance for three of the case studies. These water balances utilize a technical, objective approach to assess the producers' water rights, current conservation efforts, and barriers or opportunities for future conservation. They underscore the reality that conservation practices are different on every operation and unique from farm to farm.

As the pressures of climate variability and drought increase, farmers and ranchers are at the forefront of our national adaptation strategy. Producers are coming together to help one another, but they also need support from consumers, policy makers, scientists, and service providers. The Alliance hopes that these case studies will provide policy makers and other stakeholders with a more nuanced understanding of the diversity and complexity of western agricultural water conservation and an appreciation of what continuing to take agricultural lands out of production might mean.

Empower Locals to Develop New Storage: Sites Joint Power Authority (California)

Growing concerns about the delays and costs associated with the proposed Sites off-stream reservoir project in the Sacramento Valley of California, as well as the need for a local voice, led to the formation, in August 2010, of the Sites Project Joint Powers Authority (Sites JPA). The Sites JPA, which includes Sacramento Valley counties and water districts, was formed with the stated purpose of establishing a

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[7] Framework Proposal for Voluntary Agreements to Update and Implement the Bay-Delta Water Quality Control Plan (https://water.ca.gov/-/media/DWR-Website/Web-Pages/Blogs/Voluntary-Settlement-Agreement-Meeting-Materials-Dec-12-2018-DWR-CDFW-CNRA.pdf).

[8] https://www.youngfarmers.org/wp-content/uploads/2015/05/NYFC-template-FINAL_low New.pdf.

public entity to design, acquire, manage and operate Sites Reservoir and related facilities to improve the operation of the state's water system.

The Project would also provide improvements in ecosystem and water quality conditions in the Sacramento River system and in the Bay-Delta, as well as provide flood control and other benefits to a large area of the state of California. The formation of local JPA's was included as a key provision in the 2009 California Water Package Water Bond legislation for the purposes of pursuing storage projects that could be eligible for up to 50 percent of project funding for public benefits.

As the Sites JPA began working with the Bureau of Reclamation and California Department of Water Resources, the JPA took a common-sense approach. The JPA worked with Reclamation and DWR to put together *Foundational Formulation Principles*. In other words, first identifying the needs of the water operations system and then designing the project that would meet those needs. Local project proponents envisioned a project that would be integrated with the system they already had, and one that would also operate effectively regardless of future operational changes to the larger system, such as construction of new conveyance to export water users located south of the Delta. The JPA wanted to maximize the benefits associated with existing infrastructure and provide as much benefit as possible to both the existing state and Federal water projects at the lowest feasible cost.

The JPA has approached the Sites project with the goal of making the best possible use of limited resources, and in the end, local irrigators believe they have identified a project that is both affordable and will provide significant benefits. The proposed project maximizes ecosystem benefits consistent with the state water bond, which states that at least 50 percent of the public benefit objectives must be ecosystem improvements. Other benefits include water supply reliability, water quality improvements, flexible hydropower generation, more recreation benefits and increased flood damage reduction. In short, the JPA approached the Sites project with the goal of generating water for the environment while improving statewide water reliability and regional sustainability in Northern California. They believe they are achieving that goal.

Collaboration with Diverse Stakeholders: The Western Agriculture and Conservation Coalition (WACCC)

The Family Farm Alliance sits on the Steering Committee of the Western Agriculture and Conservation Coalition (WACC), a diverse group of organizations that first came together a decade ago around the Farm Bill conservation title with the goal of supporting the common interests of agriculture and conservation. Other founding steering committee members included Trout Unlimited, The Nature Conservancy, California Farm Bureau, Environmental Defense Fund, Public Lands Council, Arizona Cattle Growers Association, Wyoming Stock Growers Association, and the Irrigation Association. The group has expanded in recent years; for a complete list of members, go to: http://www.waccoalition.org/.

The WACC is becoming increasingly effective on the narrow list of topics its members engage in, including the farm bill that Congress passed last December, sending the compromise legislation to the President's desk. The new farm bill includes several important provisions—many of them driven by the WACC—that will assist Western agricultural irrigators. The new farm bill included expanded authority under the Environmental Quality Incentives Program (EQIP) for irrigation districts—for the first time ever—to receive funding as direct applicants for water conservation measures, as well as continued eligibility as partners for conservation activities with growers. This language was originally proposed and advocated for by the Alliance and other WACC partners starting a decade ago. The new EQIP includes funding for water conservation scheduling, water distribution efficiency, soil moisture monitoring, irrigation-related structural or other measures that conserve surface water or groundwater, including managed aquifer recovery practices. The farm bill also provides improved contracting for partners engaged in work with producers, which is intended to be streamlined and made more effective under the Regional Conservation Partnership Program. Importantly, the 2018 farm bill preserves existing authorization structure and $50 million in mandatory funding for the Watershed Protection and Flood Prevention Act, a flexible and useful program utilized by Western water managers. The demand for this program is probably at least twice as much as what was funded, but the farm bill made this mandatory funding, which is encouraging.

The WACC provides a core that can help policy makers and our collective members remember that the foundation for some true, collaborative solutions that are driven from the constructive "center." The WACC shared perspective on species conservation is rooted in our experience with practical, on-the-ground solutions that work well for ranchers, farmers, and other landowners, as well as for fish, wildlife

and plants. Indeed, maintaining a mosaic of working farms and ranches along with lands managed for conservation purposes, represents the best opportunity for conserving the ecosystems upon which species depend so that species do not decline to the point where a listing under the ESA is warranted, and so that currently listed species can recover.

Unless the agricultural industry and conservation come together, the public policies and resource management strategies necessary to maintain a viable and sustainable rural West will be impossible to achieve. There will always be isolated instances of successful partnerships. But, these discrete examples of success will not suffice. The threats to a viable and sustainable rural West are numerous, complex, and variegated. A broad and authoritative voice like that of the WACC is needed to effectively address these threats with collaborative solutions. The coalition's recent engagement and success in the farm bill's conservation title is Exhibit "A" toward that end.

HOW THE FEDERAL GOVERNMENT CAN HELP

The Congress and the Federal Government certainly cannot change the hydrology of the West, but there is a role it can play to support family farmers and ranchers. Policy makers should understand the following observations and principles as they develop new solutions to the decreasing long-term reliability of western water supplies:

- State water laws, compacts and decrees must be the foundation for dealing with shortages.
- Water use and related beneficial use data must be accurately measured and portrayed.
- Benefits of water use must reflect all economic/societal/environmental impacts.
- Water conservation can help stretch water supplies, but has its limits in certain situations (impacts to groundwater recharge by moving away from flood irrigation).
- Public sentiment supports water remaining with irrigated agriculture, and developing strategic water storage as insurance against shortages.
- Technologies for water reuse and recycling are proven effective in stretching existing supplies for urban, environmental and other uses.
- Urban growth expansion should be contingent upon sustainable water supplies; using irrigated agriculture as the "reservoir" of water for municipal growth is not sustainable in the long run and will permanently damage our Nation's food supply and rural communities.
- Planning for water shortage in the West must look to the long-term in meeting the goals of agriculture, energy, cities, and the environment.
- A successful water shortage strategy must include a "portfolio" of water supply enhancements and improvements, such as water reuse, recycling, conservation, water-sensitive land use planning, and water system improvements. New infrastructure and technologies can help stretch water for all uses.
- Temporary fallowing proposals should be approached in a thoughtful, thorough manner only after urban, energy and environmental users of water demonstrate a better management of their share of the finite supply.
- Unintended consequences associated with reducing productive agricultural land/groundwater recharge/riparian habitat benefits should be avoided and, if unavoidable, minimized and fully mitigated.

We offer the following specific actions that Federal policy makers can address in new water supply legislation:

Encourage accurate measurement and portrayal of water use and related beneficial use data

As is often the case, what happens in California often has a ripple effect that extends to other western states. For example, the common misconception that "farmers use 80 percent of the water" is applied by critics of irrigated agriculture in areas throughout the West. We need to find clear and comparable ways to present these types of water use numbers as we struggle with finding the appropriate way to prioritize our water uses among competing demands. And, we need a solid understanding of how water used for environmental purposes is really benefiting the species or habitat it is intended to protect, and how to more efficiently

manage such uses for maximum benefit using less water, the same standard to which irrigated agriculture is currently being held.

Find ways to streamline regulatory hurdles to assist in developing new environmentally sensitive storage projects and other necessary infrastructure improvements

In past Congresses, several bills have been introduced that were intended to facilitate the construction of new surface storage facilities. Congress should work to pass legislation to increase water storage throughout the western United States.

The President and Congress will prioritize whatever Federal funds are available to meet existing and future water supply needs. As for the rest of the necessary capital needed to develop and construct this new water infrastructure, it must come either from state and local governments or from the private sector. If the Federal Government cannot fund the required investments, it should take meaningful steps to provide additional incentives for non-Federal entities to fill the void, and remove barriers to the new ways of doing business that will be required.

The Alliance believes that the Federal Government must seriously consider adopting a policy of supporting new projects to enhance water supplies while encouraging state and local interests to take the lead in the planning and implementation of those projects. Local and state interests (see Sites JPA example above) have shown enormous creativity in designing creative water development projects. Water agencies have at times obtained additional Federal funding through the appropriations process; however, Reclamation could also supplement this effort by providing funding for local partnership agreements, especially where Reclamation and its water contractors are identified as potential beneficiaries.

Provide additional funding to support WaterSMART and/or other programs that provide incentive-driven cost share money for new water conservation projects

Small Federal investments in cost-shared, competitive grants help irrigation districts make larger investments in water conservation and management technologies that can help stretch water supplies to meet unmet needs. The Secure Water Act should be reauthorized to extend these grant programs into the future. Additionally, legislation should be enacted to authorize Reclamation to develop or access a WIFIA-like loan program, which would increase access to affordable, long-term, credit-based loans to help support locally developed water projects across the West.

Require fish and wildlife agencies to set scientifically based priorities and be accountable in their effort to manage environmental water

In the western United States, environmental enhancement and mitigation programs are increasingly competing for existing sources of water. In some instances, these actions have caused major conflicts, costly lawsuits and delayed benefits for endangered species and the environment. Water is far too important a resource in an era of a changing climate to utilize it in an ineffective or inefficient manner. Accordingly, the Alliance believes that all users of water should be held to the same level of accountability in their water use. Environmental interests, fish and wildlife agencies and water managers must set scientifically based priorities and be held accountable in their effort to manage environmental water. Legislative language that requires fisheries agencies to demonstrate quantifiable benefits to targeted imperiled fish species would be helpful. An institutional structure that ensures true peer review and impartial decision making relative to this objective would also be useful.

CONCLUSION

California and the West need to manage water as if every year is a drought year. We need to invest in new water storage facilities to capture water in wet years, we need to look to innovative technology to enhance management of water supplies and delivery and we need to maximize the benefits from the water we have available to meet multiple needs. The ability to measure, assess and show value for how that water is used is incumbent on every water manager—environmental, urban and agricultural.

It will be hard work to reach an agreement and enact legislation to wisely manage the West's water now and in the future, but that's the kind of work we elected you to do. Farmers work hard, and we expect Congress to do the same. We need you—all of you, urban and rural, Republican and Democrat—to come together and find a way to fix this broken system, now, before it breaks us all.

Only together can we in California and the West plan and prepare for our collective future. If we don't, we ensure only that the water supply reliability will continue to decline.

Thank you.

Mr. HUFFMAN. Thank you, Mr. Diedrich. The Chair will now recognize Mr. Harrison Ibach.

Mr. Ibach is President of the Humboldt Fishermen's Marketing Association and is a commercial fisherman in my district.

Welcome, Mr. Ibach. In my district and across the Pacific Coast, native fisheries provide a livelihood for fishermen and their families and are a key element of our local economy and culture. I want to personally thank you, Mr. Ibach. I appreciate you being here to tell this Subcommittee how drought and water supply shortages have affected fishing communities all along the Pacific Coast.

Welcome. You are recognized for 5 minutes.

STATEMENT OF HARRISON IBACH, PRESIDENT, HUMBOLDT FISHERMEN'S MARKETING ASSOCIATION, HUMBOLDT, CALIFORNIA

Mr. IBACH. Good morning Chairman Huffman, members of the Committee. It is good to be with you today. My name is Harrison Ibach. I am the President of the Humboldt Fishermen's Marketing Association, and I am the owner and captain of the fishing vessel Oceana from which 100 percent of my income is generated. I fish for salmon, Dungeness crab, and groundfish out of Eureka in Northern California. I have come here today so you can hear directly from the North Coast about the devastation that water mismanagement has caused to my family and my community.

I am going to give you the salmon industry's perspective on California's water resources, the ways these resources are being managed and abused, and what Congress might do in order to save the Central Valley from itself and assure a more equitable use of our vital water system to benefit all of the food producers of our state who rely on it.

Salmon are part of a cycle that nature has managed well for millions of years. But in the last century, water mismanagement in the West has sent our salmon into a death spiral. When I was born, in the early 1980s, there were around 4,500 commercial salmon fishermen in California. Today, there are fewer than 450 who can afford the time and the financial investment to fish for salmon each summer. It has become so bad that we have lost 90 percent of our fishery.

When King Salmon fisheries are healthy, they are an economic powerhouse, feeding America. These fish support 23,000 jobs in California and 11,000 in Oregon in a normal, non-drought year. The industry serving both sport and commercial salmon generates about $1.4 billion in economic activity by the time you add in all the multipliers, and about half that much again in jobs and dollars in Oregon, where as much as 60 percent of their ocean-caught salmon originate in California's Central Valley.

We haven't had a decent salmon season since 2013, and the fishery hasn't been reliable since long before. Decisions at the Federal level have a tangible impact on salmon stocks and on our incomes. I have personally witnessed the devastating effects of mismanagement of water. I saw the largest salmon kill in the western United States on the Klamath River in 2002. Up to 70,000 adult salmon died when water was diverted away from the river for use inland.

Relaxed regulatory oversight and maximized Delta pumping between 2003 and 2006 led to the complete closure of the salmon fishery in 2008 and 2009. Imagine that for a second. For 2 years straight, an entire industry was told it could not go to work. This shutdown was a nightmare for the fishing industry. We had to rely on Federal disaster relief to scrape by. Fishermen don't favor handouts. We know how to work hard, and we prefer to go to work.

In 2013, there was a good season because of the strong salmon protections coming from the Endangered Species Act's 2009 salmon Biological Opinion and a wet spring in 2011. In the years since, California went through the worst drought it has had in decades.

The 2009 Biological Opinion gave salmon a break for a couple of years. If it hadn't been implemented, the drought would have wiped us out for good. The overwhelming success of the 2009 Biological Opinion was short-lived due to the stressors of the 2012–2016 drought. But now the Federal Administration wants to erase the gains we made by installing an even more regressive water regime than we had before 2009. And if this Subcommittee doesn't pump the brakes and stop this callous action, we won't have a salmon fishery. And that is the truth.

Today's Bureau of Reclamation appears to me to be run more like a cash faucet for irrigators than a water agency that owns and operates storage and flood-control infrastructure. The Bureau has recently released a Biological Assessment for a new Central Valley Project Operations Program. According to experts who my organizations work with, this new management regime would be ruinous to our salmon. It would certainly bring economic devastation to the coastal communities like mine.

Members of the Subcommittee, this Administration's war on salmon must be stopped in its tracks. We know that water management can make or break a fishing season and can determine if a fisherman will be able to provide for his family. Sending water to the ocean is not wasting it—it is an investment in biodiversity, in the fishing industry, and our coastal communities. The industry is looking toward our Federal and state water managers to determine the future of salmon and our industry.

Looking forward, the projects and standards being pursued at the Federal level will only help push salmon and West Coast commercial fishermen to extinction.

Honorable members of the Subcommittee, please make sure salmon fishermen are protected so we can continue to share nature's bounty with you and our fellow Americans. Thank you.

[The prepared statement of Mr. Ibach follows:]

PREPARED STATEMENT OF MR. HARRISON IBACH, PRESIDENT, HUMBOLDT FISHERMEN'S MARKETING ASSOCIATION

Good morning Chairman Huffman, members of the Committee. It's good to be with you today. My name is Harrison Ibach, I'm the President of the Humboldt Fishermen's Marketing Association and I'm the owner and captain of the fishing vessel Oceana from which 100 percent of my income is generated. I fish for salmon, Dungeness crab, and groundfish out of Eureka in Northern California. I've come here today so you can hear directly from the North Coast about the devastation that water mismanagement has caused to my family and my community. I'm going to give you the salmon industry's perspective on California's water resources, the ways these resources are being managed and abused, and what Congress might do in

order to save the Central Valley from itself and assure a more equitable use of our vital water system to benefit all of the food producers of our state who rely on it.

Commercial fishing has been a noble occupation since before the founding of this country. The ocean's bounty has been a cultural and culinary mainstay of the West Coast for thousands of years. And in our part of the world, salmon is king. Or at least it was.

Salmon are part of a cycle that nature has managed well for millions of years. But in the last century, water mismanagement in the West has sent our salmon into a death spiral.

When I was born, in the early 1980s, there were around 4,500 commercial salmon fishermen in California. Today, there are fewer than 450 who can afford the time and financial investment to fish for salmon each summer. It has become so bad that we've lost 90 percent of our fishery.

When king salmon fisheries are healthy, they're an economic powerhouse, feeding America. These fish support 23,000 jobs in California and 11,000 in Oregon in a "normal" non-drought year. The industry serving both sport and commercial salmon generates about $1.4 billion in economic activity by the time you add in all the multipliers, and about half that much again in jobs and dollars in Oregon, where as much as 60 percent of their ocean caught salmon originate in California's Central Valley.

We haven't had a decent salmon season since 2013, and the fishery hasn't been reliable since long before. Decisions at the Federal level have a tangible impact on salmon stocks, and on our incomes.

I have personally witnessed the devastating effects of mismanagement of water. I saw the largest salmon kill in the western United States on the Klamath River in 2002. Up to 70,000 adult salmon died when water was diverted away from the river for use inland.

Relaxed regulatory oversight and maximized Delta pumping between 2003 and 2006 led to the complete closure of the salmon fishery in 2008 and 2009. Imagine that for a second. For 2 years straight an entire industry was told it couldn't go to work. This shutdown was a nightmare for the fishing industry. We had to rely on Federal disaster relief to scrape by. Fishermen don't favor handouts—we know how to work hard and we prefer to go to work.

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The overwhelming success of the 2009 Biological Opinion was short lived due to the stressors of the 2012–2016 drought. But now, the Federal Administration wants to erase the gains we made by installing an even more regressive water regime than we had before 2009. And if this Subcommittee doesn't pump the brakes and stop this callous action, we won't have a salmon fishery. And that's the truth.

Today's Bureau of Reclamation appears to me to be run more like a cash faucet for irrigators than a water agency that owns and operates storage and flood control infrastructure. The Bureau has recently released a Biological Assessment for a new Central Valley Project operations program. According to experts who my organization works with, this new management regime be ruinous to our salmon. It would certainly bring economic devastation to coastal communities like mine. Members of the Subcommittee, this Administration's war on salmon must be stopped in its tracks.

We know that water management can make or break a fishing season and can determine if a fisherman will be able to provide for his family. Sending water to the ocean is not wasting it—it is an investment in biodiversity, in the fishing industry, and our coastal communities. The industry is looking toward our Federal and state water managers to determine the future of salmon, and of our industry.

Looking forward, the projects and standards being pursued at the Federal level will only help push salmon, and West Coast commercial fishermen, to extinction.

We have a saying in California fisheries: are you here for the salad, or are you here for the main course? Honorable members of the Subcommittee, please make sure salmon fishermen are protected so we can continue to share nature's bounty with you and our fellow Americans. Thank you.

Mr. HUFFMAN. Thank you, Mr. Ibach. I thank the panel for the testimony. I want to remind Members that Committee Rule 3(d)

imposes a 5-minute limit on questions. The Chair will now recognize Members for any questions they may wish to ask the witnesses.

I will start by deferring to Mrs. Napolitano.

Mrs. NAPOLITANO. Thank you, Mr. Chairman. I would first like to introduce a letter that I sent as Chair of this Committee on August 28, 2009 to Mr. Ken Salazar, Secretary of the Interior, on recycled water.

I focus mostly on recycled water because in California we are in the desert in the south of California. And we have had a long battle with Northern California over the water. And the spectrum is everything. There is no silver bullet to the water wars that we have in California. However, I would like to suggest that we refocus on making water. By making water I say recycled water, specifically.

The letter included how to look at the establishment of a 1 million acre-foot new water program, help farmer irrigation efficiency, and establish a water conservation initiative for urban and rural water districts.

That said, I understand the Committee's effort to bring it all together. I would like to ask a few questions, Mr. Willardson.

Title XVI has been successful in helping construct water recycling infrastructure and is greatly underfunded. We currently have $64 million approved by the Committee, but none funded. There is no way to fund these projects with $50 million a year. I introduced a bill that increased the authorization to $500 million so we can finally start to adequately fund and complete the approved projects.

I have heard firsthand not only from my water agencies, but from up and down California and other states, how vital the program is. Do you believe recycled water projects are the most cost-effective solution to drought management or one of the tools in the box?

And to start refocusing investments to our recycled water, do you think an increase in Federal funding would help this problem?

Mr. WILLARDSON. Yes, Representative Napolitano. The Council supports an all-of-the-above approach to diversifying our water resources and supplies. Obviously, water reuse is something that is being used in many areas, particularly in the Southwest. States are making their own investments, as are local communities.

As I mentioned, with respect to the Reclamation fund, the current receipts are roughly $2 billion, something under that now. We are spending about $1 billion on authorized Reclamation programs. If all of that money were spent, we could go a long ways to funding water reuse projects, or addressing some of the infrastructure deferred maintenance backlog, and a number of other projects, including rural and tribal water supply projects.

Mrs. NAPOLITANO. Thank you. We are working in Southern California to limit demand for imported water, due to the unpredictability of supply. Can you discuss the predictability that recycled water provides and how that affects the cost in the long run?

Mr. WILLARDSON. Obviously, it is an area that has sometimes been called drought-proof, in that we do have the opportunity to reuse it over and over again. I have toured the Orange County facility twice. The first time they wouldn't let me drink the water. The second time I did get to try it.

It is an important area. It is not inexpensive. There are many other areas that we have to look at. I can tell you that I have looked at conservation early in my career, and that is not inexpensive, either. I think it is one of many important areas that we need to look at, particularly in Southern California.

Mrs. NAPOLITANO. Southern California has long been the leader in modernizing water infrastructure. The county recycles more than 100 million gallons of water per day for irrigation purposes. Has the farming community gone to recycling?

Mr. WILLARDSON. I can tell you that there are a number of opportunities to capture tailwater and to reuse that water, as well as to move toward the appropriate use of different qualities of water.

Northern water, I think, in Colorado, they are looking to use wastewater that has been treated after it has been used for municipal purposes. So, there are changes that are happening, as well, of reuse in the agricultural community.

Mrs. NAPOLITANO. Thank you.

Mr. HUFFMAN. Thank you. The Chair now recognizes Ranking Member McClintock for 5 minutes.

Mr. MCCLINTOCK. Thank you.

Mr. Willardson, let me ask you this question. What is better, abundance or scarcity? I know that sounds like a trick question, but it is a very important one that we are exploring with this last line of questioning. What is better, abundance or scarcity?

Mr. WILLARDSON. Well, obviously, we would like more water or more money, or both.

Mr. MCCLINTOCK. OK, so let me go over these figures again. And these are from San Diego County. They come to us from the California Energy Commission. The mean cost of surface water storage for San Diego County was $600 per acre-foot; groundwater storage, $737 per acre-foot; importing water, $925; recycling, $1,500 per acre-foot; and desalination, which San Diego has made an enormous investment in, cost them a staggering $2,300 per acre-foot. So, desalination costs us roughly four times what surface water storage costs in San Diego, a very dry area of the country.

The question is, shouldn't we be focusing on the least expensive sources of water before we put money into the most expensive? What is better, 1 gallon of water or 4 gallons of water?

Mr. WILLARDSON. Well, I minored in economics. I know a little bit about markets, enough to know I don't like macro or micro, but I can tell you——

Mr. MCCLINTOCK. It is pretty much a rhetorical question, because I want to go on to another question I think is also very important.

Mr. WILLARDSON. I would state simply that there are many different factors that go into water cost that have to be considered. And obviously, as an economist, we look at what are the lower costs, but they are not always available.

Mr. MCCLINTOCK. Again, my time is limited, so I want to go on to another question for you.

We have heard that snowpacks are going to be reduced in the future. Precipitation is going to be realized more as rain than as snow. We are not going to be able to store precipitation as snow

in the mountains as long. Doesn't that suggest that we need to be capturing that runoff in reservoirs, rather than lose it to the ocean?

Mr. WILLARDSON. Obviously, it is going to change the regime in which we look at our water supplies.

Mr. MCCLINTOCK. If we can't store it as snow, doesn't that mean we need to store it as water?

Mr. WILLARDSON. Surface reservoirs are one. Groundwater recharge or other opportunities which are being used widely.

Mr. MCCLINTOCK. Right, so, again, it gets back to a very simple question—if we can't store it as snow, we have to store it as water, or we lose it.

Mr. Diedrich, would you agree?

Mr. DIEDRICH. I absolutely agree.

Mr. MCCLINTOCK. How about the Shasta Dam? That was built in the 1940s. It was built to an elevation of 600 feet. It was actually designed to be 800 feet. We can't even get a minor 20-foot extension over decades of studies. Would that be an appropriate policy avenue to pursue, if our objective is clean, cheap, and abundant water?

Mr. DIEDRICH. I believe it would.

Mr. MCCLINTOCK. Mr. Udall, what is your view of that?

Mr. UDALL. I don't claim to have any particular expertise on Shasta and the raising of its elevation. Clearly, in some places raising existing reservoirs makes sense. Other places, it doesn't.

Mr. MCCLINTOCK. Your father thought it made sense; he is the one who authored the 1980 legislation authorizing the expansion of Shasta.

Mr. Willardson, my limited understanding of meteorology is that the El Niño is actually triggered by warmer than average temperatures in the Pacific. Doesn't that mean, if the climate is warming, we should be expecting more precipitation overall, not less?

Mr. WILLARDSON. Again, I am not a climatologist, but I would expect that that is the case.

Mr. MCCLINTOCK. And, certainly, that is what we are observing. I cited the EPA study in my opening statement. Just within the 48 contiguous states, we have seen 17 one-hundredths of an inch per decade of increased precipitation. Over 12 decades, that is 2 inches of additional precipitation per year, so it seems like we are looking at more water, not less.

The problem is how we are able to store it, transfer it as snow in the mountains to water in our reservoirs, to transfer it from wet years to dry years, and to transfer it from wet regions to dry regions.

Mr. WILLARDSON. The challenge, really, is where that water is going to fall, and how that is going to change. And we do not have an understanding of the dynamical earth systems to be able to make those predictions.

Mr. MCCLINTOCK. Mr. Diedrich, you testified we are at 115 percent of snowpack right now. You are getting 35 percent of allocations. Why the difference?

Mr. DIEDRICH. The difference is because of cold water being held in Shasta for salmon, basically.

Mr. MCCLINTOCK. Well, let's look at the salmon, looking at the relative numbers for California. Agriculture produces about $50

billion a year in direct product. The salmon industry, $88 million. So, for every dollar that the salmon industry produces, agriculture generates $568. Am I in the ballpark there?

Mr. DIEDRICH. I believe you are.

Mr. MCCLINTOCK. Great, thank you.

Mr. HUFFMAN. The Chair now recognizes himself for 5 minutes.

Mr. Willardson, since you were asked to respond to some hypotheticals, let me ask you one. What is more valuable to western states, paper water or wet water?

Mr. WILLARDSON. Wet water.

Mr. HUFFMAN. And does building new dams make it rain or snow any more?

Mr. WILLARDSON. It does not. It does provide the opportunity to store what we do get.

Mr. HUFFMAN. Is it fair to say that over the last century, California and other western states have identified the most productive sites for dams, for the most part, and built them?

Mr. WILLARDSON. We obviously depend now on the investments that have been made in the past, and will continue to do so. And it has provided a lot of flexibility.

Mr. HUFFMAN. And with respect to new surface water storage projects, the cost estimates that you just heard for dams that were built in the previous century, the most productive sites that were identified and constructed, these new projects now that are being proposed are at a much higher cost, are they not?

Mr. WILLARDSON. They are at a greater cost, both——

Mr. HUFFMAN. Mr. McClintock has cited some costs in questioning you for recycled water and desalination, over $1,000 an acre-foot. I will just say that the new storage projects in California, if you back away the public subsidy, are very much in that range.

And lest we disparage desalination and recycling, let me just point out under the new Majority one change you see is that we don't have these little bottled water units at every desk, because for the last 6 years, while criticizing recycling and desalination as too expensive, our colleagues across the aisle thought that the taxpayer dollars should be spent on bottled water for each Member of Congress that, if you pencil it out, is over $3 million an acre-foot. So, perspective is also important.

Let's go to you, Mr. Udall. Of course we would all like to see abundance. But your testimony urged us to plan for increased scarcity and increased volatility because of climate change. What do you think is the most prudent baseline assumption as we go forward and think about the infrastructure and the policy solutions to build a resilient water supply, and why?

Mr. UDALL. The Southwest is not homogenous with regard to future water supplies. The southern portion of the United States and the southern portion of the Southwest clearly are looking at hotter and drier conditions. As you go north—and I would suggest that line might be the Colorado-Wyoming border, maybe the middle of Colorado—we expect to see increased precipitation.

Congressman McClintock's remarks about increased precip globally are true, but we have regional winners and losers. And unbelievably, we get both more floods and more droughts out of climate change. We lose on both sides.

Mr. HUFFMAN. Mr. Nelson, you spoke eloquently about communities that have been impacted by water shortages in the Central Valley. If you did away with the Endangered Species Act and all the other environmental laws that we have heard criticized in some of the testimony and the comments, would that solve the problem for the communities that you represent?

Mr. NELSON. No, it wouldn't. And, in fact, we would expect that it would make the challenge even worse. And we would say that it is a false choice to choose between environmental protections that in fact do protect our communities and in making sure that every American can have access to safe drinking water.

Mr. HUFFMAN. Mr. Udall just mentioned the notion of winners and losers. And Mr. Ibach, you offered some testimony that was a little different than what we often hear in this Committee. When there are water shortages for agriculture, I think we are very familiar with the concept of fallowing and the hardships that sometimes are felt. But we haven't had a chance to hear about what happens to fishing communities because of droughts and water management decisions. Can you speak specifically about what you have seen in your community from those impacts?

Mr. IBACH. Yes, absolutely. I know in my community we have seen a lot of hardship. I have personally witnessed many families go through many financial hardships. I have witnessed people not only lose their jobs, but forced to sell everything.

And that is not just in my community. When we are talking about coastal communities that are affected by a lack of salmon, it is not just our community in Northern California. It extends as far south as Santa Barbara in California, and all the way up to the Oregon border. And not just up to the Oregon border, it actually extends all the way up into Oregon and Washington. And not only Washington, it actually extends all the way up into Alaska, as well.

The fall-run salmon from Sacramento are actually caught up and down the entire West Coast of the United States. So, it is not just our local communities, it is actually up and down the entire West Coast.

Mr. HUFFMAN. Thank you. The Chair now recognizes Mr. Hice for 5 minutes.

Dr. HICE. Thank you, Mr. Chairman. I appreciate it. I do live in what is referred to as Lake Country in Georgia. We have over 800 miles of shoreline in my district. And just for clarification and simplification, let me just say that dams protect us both from floods and drought. I think that is an important thing for us to come to just a basic understanding, which I know we know, but it is good for it to be restated.

Mr. Diedrich, let me go to you. I am not an expert, by any means, on California. But my basic understanding is, current population there is ballpark 39 million. But the water supply is really suited for approximately 22 million. Is that your understanding?

Mr. DIEDRICH. That is a fair characterization.

Dr. HICE. A fair characterization, all right. I also am under the impression that California is expected to double in size by 2050 and have approximately 80 million. If that is the case, what in the world are they going to do? What needs to happen to catch up from currently being behind in the capacity of water? And what in the

world needs to happen to be prepared for the influx of population growth?

Mr. DIEDRICH. It is absolutely going to take a portfolio approach to every area.

But Number 1 is that we are going to have to have increased storage in the state of California. You cannot put water in the ground when there is a flood. You have to put water in the ground off season. And in order to do that, you have to store it when it comes down.

So, storage is absolutely vital. We have to find additional storage that can be built as soon as possible in the state of California.

Dr. HICE. Sounds like it is going to require a significant amount of storage, as well.

Going along with that, we also all know how much produce is provided for our country that comes out of California, just with fruits and nuts and vegetables, all that sort of thing. Probably 50 percent or so for our country comes out of California.

If what you just highlighted does not take place, the increase of storage capacity for water, how would that impact the rest of the country, in terms of produce coming out of California?

Mr. DIEDRICH. The safe and affordable food supply that comes out of the Central Valley and all of California is going to be in jeopardy. I cannot tell you at this time to what degree, other than it is going to be significant.

There are only two ways that you can deal with this. It is to control the demand, which is going to require fallowing, and land taken out of production, on top of all of the other things that we already are doing, which is conservation, water use efficiency, reuse, all of that. Or increase supply.

And Representative McClintock represented the situation fairly when he said it is just a matter of where the precipitation falls and the timing of the precipitation. So, in order to control that, we have to have additional storage.

Dr. HICE. I think your point is well taken. And it seems obvious to me that you are barking up the right tree, in terms of a solution.

One of you mentioned a while ago, someone briefly, about the Endangered Species Act. How has the Endangered Species Act complicated water rights? Or has it?

Mr. DIEDRICH. I believe that the solution is going to be a collaborative effort. I am in no way proposing that the Endangered Species Act be eliminated. What I propose is that it be managed and implemented in an equitable, scientific, and fair way.

I understand that collaboration is required between all of the stakeholders and the agencies. There are things that we can do that are non-flow projects that will increase habitat and increase the viability and the propagation of endangered species that don't have to do with water flow. Water flow is essential, obviously, but there are many other projects that we need to undertake to mitigate the harm to the endangered species.

I believe that some of the characterization today has been unfair, although I understand that this is going to be an effort that we all are going to be involved in. Mr. Nelson's problem, Mr. Ibach's problem, and our farm problem are all very much related.

Dr. HICE. I thank each of our witnesses. Thank you for your answers, and I yield back.

Mr. HUFFMAN. Thank you, Mr. Hice. The Chair now recognizes Mr. Costa for 5 minutes.

Mr. COSTA. I thank the Chairman and the Ranking Member. I think this topic is an important part of this Subcommittee's jurisdiction, and one that we will continue to work on for this Congress.

Clearly, the sustainability of our water resources, not only for California, but for the West and for our Nation, are really a determiner as to whether or not the world can deal with the challenges of climate change and the impacts of water availability for the sustainability of not only our Nation, but the world. That is really what is at risk here.

And many of you who I have worked with over the years know that I like to make a reference to using all the water tools in our toolbox, because there is not, I don't think, one single solution, but it is a combination of strategies and collaborations, as Mr. Diedrich was suggesting, I think.

Let me quickly get to a couple of questions here. Mr. Diedrich, you stated in your written testimony—and you restated it just a moment ago—that environmental interests, fish and wildlife agencies, and water managers set scientifically-based priorities and to be held accountable in the efforts to manage those. And, of course, water flow is a key component. No one denies that. But could you elaborate more specifically on what kinds of things you think would be helpful in increasing fish populations in this effort?

Mr. DIEDRICH. A lot of that work is going on right now, today. Public water agencies that fly farm water are very much engaged. There are projects—anybody that is interested, they can Google Floodplain Fatties. Right now, we are flooding rice fields to mimic the flood plain to produce food for salmon smolt. That is a project that we are collaborating with. And we are dropping root balls into certain areas of the river to provide habitat and cover for the salmon smolt to protect them from predators. There is a tremendous amount of work that is ongoing today to identify the stressors that are in the system that are affecting the endangered species.

Mr. COSTA. I appreciate that. Let me go on, because there are a lot of examples, as you noted, and others that I would like to submit for the purpose of the hearing that are collaborative efforts that we should acknowledge.

Mr. Ibach, the impacts of your fishing communities are heartfelt, and I know of them from my colleagues. They are very similar to the stories that we have had during the height of the drought in our farm-working communities, where we have had unemployment levels as high as 40 percent, and close to 50 percent. So, the drought has had mutual negative impacts.

When we look at the impacts of climate change, sea levels rising, the impacts of water temperatures—and you noted on the Sacramento River—and we had a great debate in the last year—between 56 and 57 degrees temperature on the cold water pool behind Shasta. I have seen historical maps of the Pacific Coast up to the Canadian border, up to Kamchatka Peninsula on salmon runs. And clearly, climate change is going to impact, notwithstanding our best efforts, would you not agree?

Mr. IBACH. Yes. I agree that climate change definitely plays a role, as well.

Mr. COSTA. I mean, there are multiple factors in this. We have more population, we have rivers down the coast far below San Francisco that no longer provide the fishery resource that they used to because of a whole combination of factors and decisions that were made. Is that not the case?

Mr. IBACH. Yes, it is multiple factors. But one of the key main factors is water. Salmon need water——

Mr. COSTA. No, I understand. But 40 years ago, we had 20 million people in California. Today, we have 40 million people. By the year 2030, we are going to have 50 million people. I wish I could do something about that. Actually, I have. I have not contributed to that population growth.

[Laughter.]

Mr. COSTA. But the fact is it continues, so we have to deal with the reality.

Mr. Udall, the law of the river—I studied a lot, your father was involved—do you think that is going to have to be revisited on the Colorado when California gets its water resource from Northern California, from the Colorado, and from the east side of the Sierra? One of the seven states. What is your thought?

Mr. UDALL. There is a terrific opportunity with the negotiations that come up next year to redo the 2007 interim shortage sharing guidelines. And I think we have to look at every aspect of the law of the river during that 6-year period.

Mr. COSTA. My time has expired, Mr. Chairman. But obviously, this is a discussion that we need to continue. And your opening comments about attempting to try to put aside some of the politics that have made dealing with these issues difficult and providing solutions, I welcome, and I will work with you.

Mr. HUFFMAN. Thank you, Mr. Costa. The Chair now recognizes Mr. Fulcher for 5 minutes.

Mr. FULCHER. Thank you, Mr. Chairman. A question for Mr. Diedrich.

In my state of Idaho, I get feedback from our stakeholders quite frequently in regard to who really is making the decisions on water management. And as you know, the Western States Water Council—I think it is position 425—says that the state is to be the primary decision maker, or more local, on how the allocation, administration, and management of that water is to be handled.

In reality, because of ESA—at least the stakeholders in my state frequently come to me and argue that, hey, look, that is really not what is happening here.

So, (a) are you in line with that? Do you see some of those conflicts? And (b) if so, what types of reforms to ESA do you think we need to make, in order to allow more local control of administration of that water?

Mr. DIEDRICH. That is a very difficult question. I believe that many of our stakeholders feel the same. It is a very complicated system, where the state and the Federal cooperate with the Federal agencies. In California, we have some very powerful state agencies—we have a California State Endangered Species Act also. Everybody has to collaborate on making decisions on operation of

the system. So, we need inter-agency and collaborative effort. They all need to work to the same goal.

One of the things that would be helpful, I believe, is the FISH Act. I believe that if we can get Fish and Wildlife to have the anadromous fish species that are in commerce under one roof, it might be helpful.

Mr. COSTA. Would the gentleman yield?

Mr. FULCHER. Yes.

Mr. COSTA. I think the point that Mr. Diedrich is making is important. And not that California is always a good example, because we have our own challenges, I believe.

But Mr. Diedrich, we have been through this, you and I, for a long time. But if you could give some perspective to the gentleman as to that collaborative effort over the last 10 years, the last 5 years, a descriptive as to whether it is getting better, worse, or the same.

Mr. DIEDRICH. Well, I think certainly 5 years ago we had issues with—we had section 7 of the Endangered Species Act, for example, where we are managing each species individually. And a lot of the times what is good for one is not good for another. And if they are at a conflict, it is a problem. We have that problem with smelt and with salmon.

So, we just feel like if we could get this all in one house, it might be managed a little bit more effectively.

Mr. COSTA. Do you think the collaboration is getting better or worse?

Mr. DIEDRICH. I think it is—I went on a Delta tour recently, and I was hopeful. I think some of this Biological Assessment and this activity that is going on right now with the President's memo is a good thing. It is going to help——

Mr. COSTA. I thank the gentleman for yielding.

Mr. FULCHER. Yes. Thank you, Mr. Costa. So——

Mr. HUFFMAN. Reclaiming your time, Mr. Fulcher?

Mr. FULCHER. I am, thank you, and just more of a statement than a question at this point.

Mr. McClintock made a statement about the economic impact of the Ag. community—versus the fish and that component, economically. As I close up my amount of time, I need to echo that sentiment for my home state.

And I would also like to point out that we have made some pretty good progress with salmon flows. Frankly, it has been our Native American population and the fisheries and hatcheries that have been very integral in developing and managing, and they have helped bridge that gap.

But to think for a moment that we can sidestep the economic engine of our entire state by breaching and those types of things, we just simply have to find a smarter way.

So, Mr. Chairman, thank you. And Mr. Costa, Mr. McClintock, the panel.

Mr. HUFFMAN. Thank you. The Chair recognizes the gentleman from Orange County, Mr. Levin—Orange County being a place where they actually drink highly treated wastewater as part of their baseline water supply. And it looks pretty healthy, looks pretty good.

Mr. LEVIN. I have consumed it myself, Mr. Chairman, and I have lived to talk about it.

I wanted to thank you for holding this hearing. As many of my colleagues here on the dais know, California has a complicated water system that faces sustainability challenges, given our changing climate. Snowpack is projected to lessen as the climate warms, and the state will see a larger percentage of its precipitation in the form of rain.

With these changes and our continually growing population in mind, we must consider how to make our water resources more sustainable and reliable for our population centers.

In my district, in North San Diego County, in South Orange County, we have a number of projects that are moving our communities toward a sustainable future. I am pleased to say that the Bureau of Reclamation recognizes the value of those projects, and that the Doheny Ocean Desalination Project and the expansion of Oceanside's Mission Basin Groundwater Purification Facility are set to receive a combined $11 million from Reclamation. Together, these projects will increase access to locally sourced, great, clean drinking water.

I am proud that the water agencies in my district are building toward the future in a way that will allow them to more sustainably manage their water supply. I am also encouraged that we are finally having a long-overdue discussion on climate change, and how it relates to water supplies.

To Mr. Udall, as a scientist who studies the impact of climate change on water supplies, you may have seen reports that President Trump plans to establish a group at the White House to review climate science. The group would be led by William Happer, a physics professor who has no formal training as a climate scientist.

In November 2017, Mr. Happer said—and I quote—"It is not as though if you double CO_2 you make a big difference. You make a barely detectable difference."

Mr. Udall, do you think Mr. Happer's statement is scientifically accurate? And how would you respond to his assertion?

Mr. UDALL. That statement is not scientifically accurate.

When Chevron tells us that the Intergovernmental Panel on Climate Change is right, as it recently did, and when Exxon decides we need a carbon fee, I think the debate is over on whether or not this issue is a real issue, and we need to do something about it.

Mr. LEVIN. Another quote from Mr. Happer in March 2016. He said, and I quote, "I am trying to explain to my fellow Americans the serious damage that will be done to us and, indeed, to the whole world by cockamamie policies to save the planet from CO_2."

As a trained climate scientist, sir, how would you respond to that?

Mr. UDALL. It is not correct.

Mr. LEVIN. Finally, in November 2015, Mr. Happer said, and I quote, "If plants could vote, they would vote for coal."

As a trained climate scientist, how would you react to that?

Mr. UDALL. CO_2 does, in fact, fertilize plants. But it causes a whole series of other problems, which we are now experiencing, including 50-plus inches from Hurricane Harvey, of which 40 percent was due to climate change.

Mr. LEVIN. I appreciate your good work on behalf of evidence and climate science. And I would hope that others would acknowledge the overwhelming scientific consensus. And hopefully that will happen eventually in the White House, as well.

With that, Mr. Chairman, I yield back my time.

Mr. HUFFMAN. Thank you. The Chair now recognizes the other gentleman from the Central Valley, Mr. Cox, for 5 minutes.

Mr. COX. Thank you so much, Mr. Chairman. Thank you, everyone, for being here today.

There is probably no place that feels effects of climate change greater than the Central Valley of California. We have seen it in our shorter winters, our hotter summers, reduced precipitation, and certainly in the unreliability of our water supply. And our Nation's water supply has been clearly impacted by climate change in my district, in California's Central Valley, as Mr. Nelson well knows and previously testified.

Everyone, from our farmers, our ranchers, and, most importantly, our rural communities, have been severely impacted by California's last drought and the ongoing lack of water supply and access.

Water supply reliability is an issue that affects every other issue. You can't talk about health care without talking about lack of access to clean drinking water. You can't talk about job security, you can't talk about economic growth, or the stability of our communities without talking about a reliable water supply and long-term water storage. And the reality of it is that our way of life is completely determined by our access to reliable and clean drinking water.

And this isn't a partisan issue at all. We must find compromise and smart solutions to address our water supply reliability. That is why we were elected to Congress, that is why we sit on this Committee today, and it is why we are here today.

So, with that, I have a few questions.

Mr. Nelson, rural communities, as you pointed out, are especially vulnerable to running out of water during times of drought. They often rely on groundwater wells that tend to be relatively shallow. In recent years, many communities in my district have literally run out of drinking water and have had to rely on emergency bottled water deliveries.

What specific impacts have you seen in the communities you serve in California from the drought?

Mr. NELSON. Thank you for that question. It manifests as a human catastrophe. I mean, just imagine going home and having to take your children to a community portable shower in a trailer. That is the reality.

There are also, as already has been pointed out, economic impacts. How can we expect our communities to thrive, when we can't provide something as basic and fundamental as safe drinking water?

That is a public health crisis of our time, and it needs to be addressed.

Mr. COX. Mr. Ibach, you said something that kind of piqued my interest. And if you could provide a little bit more color. When you said, "what Congress must do in order to save the Central Valley from itself,"—could you give me a little more explanation on that statement?

Mr. IBACH. I think that goes right along with the other communities.

Another community that we failed to mention was that the inland community around the Sacramento River also relies on salmon, as well. There is a large portion of people, small communities up and down the entire river system, that benefit with more salmon in that river.

Mr. COX. I appreciate that. But how does that go back to the Central Valley saving itself from itself? I mean, I am still unclear what you meant by that. I am not trying to put you on the spot or anything like that, but it is——

Mr. IBACH. I think that the point I was trying to make there, is that we need to further have better water management, all together. And we do need to work together. And the Central Valley, I think, obviously, needs to put—in my personal opinion—a lot more effort into our salmon stocks, because we are a dying industry.

It has almost been a nail in the coffin for our industry and for a lot of people. So, I just can't emphasize enough how bad we need water to really help salmon for——

Mr. COX. Well, fair enough. And I could tell you that the people I represent, the Ag. community, the rural communities, we are all looking for a collaborative approach, so it is not fish versus farms.

And I think Mr. Diedrich could probably speak a little bit about that, with some of the conservation efforts that you are taking. And, if you wouldn't mind, providing a little more color around some of the things that you do.

Mr. DIEDRICH. Absolutely. One of the things Representative Napolitano had asked earlier was about whether or not we are engaged in reuse. And I would like to address that, because we are.

There are some very large water supply projects, where we are taking the same water that Orange County is drinking and putting it back in the Delta-Mendota Canal. And we are using it for irrigation water, so we are using every available tool in the toolbox, as Representative Costa mentioned earlier, to try to produce a reliable water supply so we can continue to produce a safe and affordable food supply. So, absolutely.

Mr. COX. Thank you so much.

Mr. HUFFMAN. And Mr. Cox, just for what it is worth, I took that statement about saving the Central Valley from itself to mean that, in the absence of better water management, we will continue to see chronic groundwater overdraft, and the need for infrastructure repairs, and other things.

But maybe at some point we can go into more depth into that. I think that there is a broader explanation of what that might mean.

Mr. COX. Yes. Frankly, it wasn't a loaded—I wasn't trying to make a point. I was just really trying to understand the context of the statement.

Mr. HUFFMAN. Absolutely. Well, let's do this. We are going to close now, and I thank the witnesses and the Members for their engagement.

But one of the things I would like to do before we do that, Mr. Gosar, who, I believe, is on this—no, he is not on this Subcommittee, but he has been in the past. He has this little thing when he chaired this Subcommittee, where he would close by asking each witness, in 1 minute or less, to say what is the question you were not asked that you wish you had been asked, and see if they can just close out with that 1 minute or less.

Let's do that, starting with Mr. Ibach here on the end, and we will give Mr. Udall the final word. One minute or less, what do you wish you had been asked, and what would you have said?

Mr. IBACH. I really wish I would have been asked more about the impacts on our fishery, honestly, and the people that I represent. The fishing community has been in peril. We heavily rely on salmon in a big way. And I wish I could just have more time to elaborate on how bad our situation is in the fishing industry.

A lot of salmon rivers, 80 percent of the water is taken away from salmon rivers, rivers that have salmon in them. That leaves a remaining 20 percent. I just can't emphasize enough how bad we have been struggling, and how bad we need this water. Water going to the ocean is not being wasted. That water going to the ocean is a crucial key factor for the survival and the longevity of keeping salmon around, which we need.

Mr. HUFFMAN. Thank you, Mr. Diedrich, what do you wish you had been asked, and what would you have said, in 1 minute or less?

Mr. DIEDRICH. Well, I don't know if it hasn't been asked, but I have a few other things I can say. The issue for California agriculture is, obviously, the Central Valley, California overall, produces a safe and reliable food supply.

And we believe that it is a national security issue, not only in the economic dollars involved with our production, but having the control of our own food supply, and having it be safe, and have it being produced under a highly regulated, sustainable system. There is no doubt that our water supply reliability is a prime factor in our ability to do that. And in order to produce a reliable water supply, we are going to have to deal with many, many other issues.

Ag. has done its part in water conservation, water use efficiency—today we produce more food per drop of water than we ever have. We have increased our production incredibly. We take advantage of every door that we see open. Every tool available, we take advantage of.

Mr. HUFFMAN. Thank you.

Mr. DIEDRICH. I just ask that this Committee do their work, do their job, and encourage Federal agencies and Federal water management to cooperate with the state and all the regulatory agencies.

Mr. HUFFMAN. Thank you, sir.

Mr. Willardson?

Mr. WILLARDSON. I think I would emphasize the collaborative nature and the difficult choices that we are going to have to make, moving forward.

I would mention, on the Endangered Species area and changes, Governor Kempthorne of Idaho—then Senator—and now the Western Governors, have a long list of recommendations for addressing endangered species.

I would also point out that farmers are fishermen. Being in Utah, we do have some kokanee, but I don't fish much for salmon. But I used to fish for trout. I think finding these economic and environmental balances are important.

And Representative McClintock, one of my first papers 40 years ago, when I went to work for the Council, was on conservation. It does not create new water. But it is something that we have to look at. And it can be expensive.

These are very site-specific issues. I live in the Salt Lake Valley. Utah is the second-highest per-capita water user, next to Nevada, in the West. And in Salt Lake City, I live next to the mountains, where we get our snowpack. Our supply is the snowpack. We don't have to move it through large canals, as they do in California. We don't have to treat it much. We live on lots, and we all have large families, which contributes to that.

They are in the process of beginning to discuss metering my secondary water system, which I now have. And I pay a lot less than when I was using municipal water to irrigate my property.

But it is really site-specific when you look at conservation, when you look at water supply, and you look at the costs and benefits. And we have to do that in a collaborative manner, recognizing everyone's needs.

Mr. HUFFMAN. Thank you, Mr. Willardson.

Mr. Nelson?

Mr. NELSON. Thank you, Chairman. One question that comes to mind is how do we secure every American's basic human right to water?

As I have already shared, this is a public health crisis. It is happening under our watch. It is an environmental justice crisis. And because of climate change, it is only going to become more of a challenge.

So, as already has been mentioned, we do need more funding for water infrastructure. But to go back to this concept of a portfolio approach, we would say that it needs to be a smart, protective, and environmentally just portfolio approach. And we need to act not in the future, not in any other moment. We need to act right now. Thank you.

Mr. HUFFMAN. Very good.

Mr. Udall, last word.

Mr. UDALL. My question is what is the risk if the Colorado River Drought Contingency Plan is not put into place. And the risk is, if we empty Lake Mead, all bets are off. Water rights are meaningless at that point. We will have no rules for how this system operates. And the Federal Government will be in charge of allocation decisions, which should scare everyone. And they will be making these decisions without full understanding of the consequences. The DCP has to get across the finish line.

Mr. HUFFMAN. Very good. Well, thanks again to all of the witnesses. This hearing has helped spotlight some of the challenges we will have to manage now, and in the years to come to secure our Nation's water supply. This Subcommittee will work hard and thoughtfully to craft policy solutions that promote water supply reliability for all affected stakeholders. And I thank our witnesses for joining us to inform that important work.

Members of the Committee may have some additional questions for the witnesses, and we will ask you to respond to these in writing if that is the case.

Under Committee Rule 3(o), members of the Committee must submit witness questions within 3 business days following the hearing, and the hearing record will be held open for 10 business days for these responses.

If there is no further business, without objection, the Committee stands adjourned.

[Whereupon, at 11:27 a.m., the Subcommittee was adjourned.]

[ADDITIONAL MATERIALS SUBMITTED FOR THE RECORD]

Submission for the Record by Rep. Cox

STATEMENT OF THE SOUTH VALLEY WATER ASSOCIATION

The South Valley Water Association (SVWA) consists of nine irrigation districts that wield water for agriculture within the Central Valley Project's (CVP) Friant Division. SVWA represents more than 400,000 acres of the world's most productive farmland in the southern end of the Great Central Valley of California. Farmers in SVWA grow a diverse group of agriculture commodities including: cotton, grapes, oranges, and a variety of different nuts and dairy products.

Collectively, the SVWA irrigation districts deliver up to 1 million acre-feet of water annually to farmers in the Central Valley.

Water supply reliability in the San Joaquin Valley will require robust state, Federal and local investment in infrastructure, along with coordinated and balanced approaches to water management to ensure that one of the world's most productive agricultural regions can continue to provide good jobs and safe, affordable food to all of the United States.

SUBSIDENCE

Subsidence is an issue that plagues the entire state of California but nowhere are the impacts as visible as in the San Joaquin Valley. Because of subsidence, the Friant-Kern canal, which relies entirely on gravity to deliver water to communities and a total of 1 million acres of farmland, has lost roughly 60 percent of its carrying capacity, as the canal has literally sunk into the ground creating pinch points upstream of some of the largest users of water. These pinch points prevent the efficient movement of water and have caused severe economic impacts.

As the state of California moves toward implementation of the Sustainable Groundwater Management Act (SGMA), the inability to efficiently move water through the Friant-Kern canal creates significant hurdles as it limits the ability to move water from Millerton Lake through to the southern end of the Friant service area. This part of the San Joaquin Valley has significant groundwater recharge potential, but it can only be fully realized if the infrastructure exists to deliver water during times when excess flows are in the system.

The double-sided impact of subsidence is not just the inability to deliver irrigation and recharge water and gain the resulting benefits, but also that the diversion of that water into the Friant-Kern Canal is also part of mitigating flood impacts on the levy systems below Friant Dam.

Subsidence is also not limited to just the Friant-Kern Canal. In 2017, the levies of the lower Kings River had sunk enough that flood releases threatened the communities of Huron and Tranquility. Scenarios like that will continue to play out in the San Joaquin Valley until the impacts of subsidence are addressed.

MULTI-BENEFIT PROJECTS

Farmers in the San Joaquin Valley will inevitably have to fallow land in order to reduce groundwater demand and meet the requirements of SGMA. Because of this, SVWA has developed a unique partnership with The Nature Conservancy (TNC) to advance multi-benefit land retirement projects. SVWA and TNC are in the process of implementing a strategic land retirement program to ensure that land retirement is done in a way that minimizes impacts to disadvantaged communities and creates ecosystem benefits. A scattered approach to land retirement will have severe socio-economic impacts and limit habitat connectivity. The program will identify lands for fallowing based on their habitat potential and will create habitat connectivity in a region that has historically been characterized by a checkerboard of farmland and habitat.

Strategically retiring and restoring parts of the farming landscape to natural habitats, as opposed to leaving them fallow and unused or converting them to houses or industrial uses, could significantly increase the potential for recovery of dozens of endangered species in the San Joaquin Valley.

Restoring former agricultural lands to natural habitats can also deliver other environmental benefits that provide tangible services for farmers and San Joaquin Valley residents. Restored lands can be a reservoir of abundant native pollinators needed for crop production and natural enemies of agricultural pests which can reduce the pest burden in many crops. Reducing the agricultural footprint may also help reduce air quality problems that are leading to chronic human health issues in the San Joaquin Valley, like high rates of asthma. Retiring and restoring targeted agricultural areas will create the possibility of reducing overall nitrate loading in groundwater over time that currently affects rural communities and contributes rates of birth defects that are higher than state averages. Further, it could also significantly contribute to helping the state meets its 2030–2050 targets for reducing greenhouse gas emissions a potential source of funding for landowners and water agencies to help defray the costs of lost production and restoration.

HEALTHY ECOSYSTEMS

SVWA recognizes that healthier fisheries lead to more reliable water supplies and that the two are not mutually exclusive. Farmers versus fish is a counterproductive approach that only fosters division—the traditional paradigm that more flows lead to more fish hinders progress. Science shows that efforts to improve fish populations should focus on habitat restoration, predator control and functional flows—flows at the right time and place, rather than additional requirements for minimum instream flows. Efforts to reactivate floodplains for fish in the Sacramento Valley have shown incredible promise and should be replicated on the Lower San Joaquin River.

Submission for the Record by Rep. Napolitano

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON NATURAL RESOURCES,
WASHINGTON, DC 20515

August 28, 2009

Mr. Kenneth Salazar
Secretary of the Interior
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240

Dear Mr. Secretary:

As chair of the Subcommittee on Water and Power, I have grave concerns I felt I must share with you. Please forgive the lengthy explanation; I felt it must be given.

Drought in California is polarizing the state, taking up valuable time and resources resulting in considerable debate and finger-pointing as to who/what to blame. Thank you for recognizing that the issue is big enough and requires you dedicating high level staff to addressing the problem.

The quandary we face is to both reduce demand and increase supply. Historically, water developers have focused on increasing the size of the water pie. Developing new water supply takes years to accomplish (fifteen years by the Governors own estimate), costs billions of dollars, presently lacks public consensus, public and political will, and united support. Addressing the water equation by reducing demand has already resulted in extensive efforts in Southern California to reduce water consumption (local regulations), improving conservation efforts (low flow toilets and shower heads) and educating the public (PSA's and notices in water bills). This has lessened impacts, but as the population continues to grow and the drought continues, the demand will increase beyond what conservation alone can provide.

The California Congressional delegation is a diverse group. One thing that we all agree on is that the water crisis in California is significant, requires leadership and development of a solutions portfolio that builds upon our abilities to confront problems, and uses our innovation and ideas to mobilize the resources necessary to addresses the issues. Some of us have been giving the California water issue serious review and determined that the Subcommittee needed to explore options.

What Does a Water Solution Look Like?

Over the past two months I have had the Water and Power Subcommittee staff director, Dave Wegner, researching the issue and our potential roles. I have been briefed on initial findings and we will be briefing the subcommittee upon our return in September. We are offering our full assistance to address the long, mid and short-term actions that can be taken to develop water solutions for California and, by learning from these efforts, provide opportunities for the rest of the Western United States. Our concern is that the drought of the last three years may continue into 2010, possibly further. We need to implement actions now that will provide the ability to let the Department focus on the long-term solutions.

Solutions to the California water crisis must be based on a diversified and dynamic approach, allow for appropriate planning and permitting that will ultimately allow delivery of water in a timely and cost effective manner. There is no one single "silver bullet" that will solve the water crisis. The challenge we face is to develop a cooperative approach that cumulatively will yield a diversified portfolio and strategy that will result in increased supply, reduced risk, and improved water security, sooner rather than later.

It is indisputable and imperative that discussions and efforts directed at long-term solutions continue. At the same time, we must recognize that when creating new water from large water projects, all parties and all interests are defined by an immutable rule: the last dollar must be spent to get the first drop of water. The bottom line is that until we spend the last construction dollar, no one gets the first drop of water from any of these proposed projects.

In the course of our research, we have asked state water leaders when new water supplies could be brought on-line, addressing the question, when does California achieve that "first drop?" The answers range from 2020 to 2030, depending on a plethora of unknown factors. In reality the year doesn't really matter. The point is there is no immediate construction action that can be taken to create new water.

Creating solutions to water demands must incorporate a range of ideas and approaches. Water managers must continue to explore, and analyze long-term solutions associated with the Delta, evaluating new water sources, including storage and conveyance. At the same time, it is equally imperative that a plan be adopted to address our immediate challenges.

The Goal: Creating 1 MAF of Water for California in the Near Term

Let me reiterate again Mr. Secretary, we want and are anxious to work with the Department on a portfolio of solutions for the water crisis in California. We want to look for solutions and approaches where Congress and the Administration can work collaboratively on solutions. As Chairwoman of the Subcommittee on Water and Power, I submit the following recommendations for immediate actions on your part, to address challenges to the California water crisis. Each is based on the concept of stretching existing water supplies in order to increase the amount of available water and does not require new legislation, only strong and decisive leadership.

(1) Bureau of Reclamation to establish a 1 Million Acre Foot new water program

- Grow new water in the State—throughout the State
- Create, in the next 48–60 months, 1 MAF of new water annually
- Develop this new water without regional water user or environmental conflict

- Accomplish this objective utilizing the Bureau's Title XVI program, identified by the Commissioner on July 21, 2009, as part of Reclamation's core mission. (We agree with the Commissioner's statement made before the Subcommittee and believe that by working with 0MB we can develop support for funding.)

(2) Bureau of Reclamation to establish a "Farmer Helping Farmer" Irrigation Efficiency Initiative

- Make funds available to water districts, water agencies and individual irrigators to invest in on-farm irrigation efficiencies to stretch our existing available irrigation water. These funds could come from the Reclamation Rural Water Program and other funding vehicles identified in previous legislation.
- Consistent with CVPIA and Reclamation law, allow districts or irrigators to sell, rent or lease water savings to other irrigators.
- Implement improved and less bureaucratically cumbersome transfer incentives for farmers and water districts to allow the efficient and timely movement of water from and through existing facilities.

(3) Bureau of Reclamation to establish "Water Conservation" Initiative for urban and rural water districts

- Make funds available to water districts, water agencies and others as appropriate to invest in conservation efforts (i.e. irrigation methods, scheduling, land leveling, etc.) that stretch existing water supplies. These funds could come from the Reclamation Rural Water Program and other funding vehicles identified in previous legislation.
- Consistent with CVPIA and Reclamation law, allow districts and/or irrigators to sell, rent or lease water saved to others.

The objective of these recommendations is to stretch the water supplies we have. In the short term, we have adequate water supply to meet the needs of the State of California. What is lacking is the bureaucratic ability to efficiently move water, incentives for water right holders to allow for the efficient use of water, and leadership to address how to get it done.

We can implement programs here and now to create 1 MAF of new water annually through Title XVI, and supplement that initiative with projects to stretch existing supplies throughout the State—from our cities to our farms.

Recommendations requiring action:

- **The Interior Department and Bureau of Reclamation submit, urgently, a $250 million budget amendment to the Bureau of Reclamation's budget for FY 2010 adding funds in the following amounts:**

Title XVI	$200 million
Water Efficiency (Farmer-to-Farmer)	$ 25 million
Water Conservation Initiative	$ 25 million

- **OMB, Interior, the Administration, and others as appropriate and necessary, work with the House Budget Committee, Appropriations Committee, Energy and Water Appropriations Subcommittee, Natural Resources Committee, and the Water and Power Subcommittee to implement this prior to when the Energy and Water Appropriations bill for FY 2010 is finalized in conference.** Concurrently, coordinate with the appropriate Senate committees and subcommittees.
- **The Title XVI funds should go to develop a new generation of projects—throughout the State. The objective is to (a) fund projects not funded by the Stimulus Program; and (b) underwrite at least 40 congressionally approved new recycling projects.** Today, projects throughout Southern California—in LA, San Diego, Riverside, Orange and San Bernadino Counties are on track to develop approximately 500,000 acre-feet of new water annually. This program will double that—to produce 1 MAF of new water annually and do so within 48–60 months.

While California puts 1 MAF water into service and on-line, long-term plans can proceed with the efforts of the Department of the Interior leading toward actions. California can manage our way through this challenge rather than be overwhelmed

by it. When the day arrives where California runs short of water, the direct and indirect costs will be measured in billions and the bureaucratic stress will increase exponentially. **We need to act now and act in a concerted, strategic approach.**

What can be done immediately?

Congress has provided tools so we can begin work now to resolve the water crisis. First, the Title XVI water recycling and water reclamation program can be the centerpiece of a constructive solution. As a result of investment in it, **new wet, not paper**, water can be created and placed in service throughout the State. Recycled water developed throughout California relieves pressure on the Delta, and, in turn, helps water districts and water users in the San Joaquin Valley, particularly those on the West Side, who have junior water rights and water entitlements.

A $200 million investment in Title XVI automatically leverages an additional $600 million from the water districts and financial lenders. By law and policy, water districts are eligible for a 25% cost-share, not to exceed $20 million. This is the most cost-shared water resources program in the Federal Government. This investment **stimulates new business, puts people to work, develops green jobs, produces 1 MAF of new water annually** and helps the State manage its way through this water crisis.

The bottom line to the Water and Power Subcommittee is that we believe that Congress has given the Department tools to address the California water crisis. We believe that solutions must include near, mid and long-term actions. And finally, we believe that cooperatively we can work with the Department to strategically plan for and implement actions that will result in water in the faucet, will work with local water districts, will put people to work, and will provide leadership in addressing long-term water planning and production.

What we would like to Suggest.

We respectfully request a sit down meeting to discuss these ideas with you, identifying what we can do to work with the Department in meeting the water needs of California, and doing so in a cost effective and environmentally sensitive manner. We look forward to your favorable reply and meeting with you in September. Please contact the Water and Power Subcommittee or myself to set up the meeting.

Warm Regards,

GRACE F. NAPOLITANO, CHAIRWOMAN
Water and Power Subcommittee

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ATTACHMENT

Supporting Justification for Proposal Suggestions

This request is consistent with:

- Bureau of Reclamation Feasibility Study on Water Recycling in Southern California
- Bureau of Reclamation Feasibility Study on Water Recycling in the Bay Area
- State of California Task Force on Water Recycling
- DWR's Bulletin 160
- MWD and SAWPA approved programs
- Other?

Water Recycling Benefits

- Consistent with stimulus objectives
- Creates green jobs
- Provides for continuity of construction jobs in counties most impacted by the recession
- Relieves pressure on the Delta, short-term and long-term
- Consistent with reduced energy and lower carbon objectives
- Provides drought relief
- Consistent with climate change policy objectives

- Develops new water supplies (and does so without generating political conflicts)
- Projects can be designed, approved, funded, constructed and operated within a short time
- No other alternative can produce 1 MAF as quickly or efficiently.

Farmer to Farmer Initiative Benefits

- Allows farmers to develop and implement solutions locally
- Can be accomplished with days, weeks and months . . . all short term
- Proven technologies can be applied to modernize and improve water management locally
- Maximizes flexibility to local districts and irrigators within their immediate regions

Conservation Initiative Benefits

- Fastest and least expensive way to "create" new water
- Urban water agencies have a demonstrated capacity

Submission for the Record by Rep. Van Drew

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
WASHINGTON, DC 20515

February 26, 2019

Hon. RAÚL M. GRIJALVA, *Chairman*,
House Committee on Natural Resources,
1324 Longworth House Office Building,
Washington, DC 20515.

Dear Chairman Grijalva:

Please excuse my absence for today's Water, Oceans and Wildlife Subcommittee hearing on "The State of Water Supply Reliability in the 21st Century" due to a family emergency.

Sincerely,

JEFF VAN DREW,
U.S. Representative,
New Jersey—District 2

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